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For

His Imperial Majesty

The Emperor of Austria

In all Humility

from

The Author

W. Reid Clanny



63746
Lady Penzance Collection

HYPERANTHRAXIS;

OR,

THE CHOLERA OF SUNDERLAND.

BY

W. REID CLANNY, M.D. F.R.S.E. M.R.I.A.

PHYSICIAN TO H. R. H. THE DUKE OF SUSSEX, SENIOR PHYSICIAN TO
THE SUNDERLAND INFIRMARY AND DISPENSARY, AND MEDICAL
MEMBER OF THE SUNDERLAND BOARD OF HEALTH.

LONDON:

WHITTAKER, TREACHER, AND ARNOTT.

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TO

HIS ROYAL HIGHNESS

PRINCE AUGUSTUS FREDERICK,

DUKE OF SUSSEX,

EARL OF INVERNESS, BARON OF ARKLOW,

K.G., K.T., G.C.H., P.R.S.,

&c. &c. &c. &c. &c.

WHOSE TRANSCENDENT TALENTS

AND ACQUIREMENTS

IN LITERATURE, SCIENCE, AND POLITICS,

ARE KNOWN,

AND DULY APPRECIATED,


THROUGHOUT THE CIVILISED WORLD,

THIS TREATISE IS,

BY PERMISSION,

MOST HUMBLY DEDICATED.

PREFACE.



I HAVE explained elsewhere the cause of the unavoidable delay which has taken place in the publication of this treatise ; at the same time, I have the consolation of knowing that I have faithfully performed my promise.

Up to this moment, I have neither said nor written one word which I wish to retract ; though I have come in for my full share of abuse in the cholera conflict.

Upon retrospection, I am gratified that I had the good fortune to experience, as Chairman of the medical department of the Sunderland Board of Health, the most cordial co-operation and support of, at least, two-thirds of the medical gentlemen of this place ; to whom I take this opportunity of offering my warmest acknowledgments for the kind address

which they were pleased to present to me at a time when I was assailed by popular clamour for conscientiously performing my professional duty. The personal exertions of the Rev. Robert Gray, Rector of Sunderland, during the visitation, were uniform with his other acts of charity and benevolence.

In prosecuting my inquiries into the nature and method of cure of this epidemic, I have held in remembrance the words of Cotes—

“Obtinebit igitur apud probos et æquos judices præstantissima philosophandi ratio, quæ fundatur in experimentis et observationibus.”

I have ventured to give an appropriate name to this pestilence, to which I am prompted from my own experiments. I expect that it will be received by the medical faculty instead of “cholera,” literally a flowing of bile, though in this disease, when formed, no bile flows, as far as I have been able to ascertain from personal observation. *Hyperanthrax* ex *ἀνθραξ* super et *ἀνθραξ* carbo, anglice, excess of carbon.

HISTORY
OF
EPIDEMIC CHOLERA,
&c. &c.

THE summer of 1831 was more than usually mild and genial. In the autumnal months, we had, at Sunderland, a considerable number of severe cases of scarlatina, and also of sporadic cholera, though neither at that time, nor for many months previous, had I seen any fatal cases of indigenous cholera in the town or neighbourhood. We had some cases of typhus, and, as far as I can learn, we had no epizootic amongst our domestic animals. In the summer of 1831, I often observed immense flocks, if I may use the term, of young toads, in the vicinity of Sunderland, which I pointed out to several friends. To one gentleman I shewed them, close to his house, and he immediately, very properly, removed a fish-pond which had always been too near his resi-

dence. We had several severe thunder storms, and consequently sudden changes of the weather, in the months of September, October, and November.

The commencement of the epidemic cholera was, according to my personal observation, about the beginning of the month of October; and I find in my memoranda of cases, that on the night between the second and third of November, much lightning occurred; and it is worthy of remark, that exactly at this time our first five fatal cases were drawn up, and reported to the Board of Health, at London. Upon the 2nd of November we had no new cases, nor upon the 3rd, 4th, and 5th; but upon the 6th, we reported six new cases and two deaths; and upon the night between the 6th and 7th, we had continued flashes of lightning during the whole night—an unusual phenomenon at this season of the year.

Upon the 7th, two new cases, and five deaths were reported.

Upon the 8th we had seven new cases, and three deaths.

Upon the 9th, no reports.

Upon the 10th, no new cases.

Upon the 11th, one new case, and two deaths.

Upon the 12th, two new cases.

Upon the 13th, no new case, and one death.

Upon the 14th, seven new cases, and three deaths.

Upon the 15th, five new cases, and one death.

At 9 p. m. we had a severe fall of snow, and upon the following day, viz. the 16th, I reported five new cases, which I had visited; and on the night between the 15th and 16th, I was informed that there had been much lightning, accompanied by thunder.

On the 16th, at 6 o'clock A. M. I observed a most vivid flash of lightning; and on the 17th we had four new cases, and one death.

18th, five new cases, and five deaths.

The epidemic cholera now continued at a steady pace till the 20th of December, when the number of cases and of deaths gradually diminished, up till the 2nd of January, 1832, when, at the Board of Health, no new cases, no deaths, and only one convalescent case were reported, to the great joy of all the inhabitants of the town of Sunderland, and to none more acceptable than to the medical men of the place, several of whom, to my know-

ledge, had been harrassed night, and day, without deriving one farthing of emolument, either from government or from the community. Nearly £2000, including £100 given by government, had been subscribed by humane individuals of the town, and county, for the avowed purpose of supporting the poor, and extinguishing the epidemic. The regular faculty were not, of course, benefitted by it; but several, independently of subscribing to the above fund, were considerably out of pocket, which, without specifying, may be readily understood.

It is well known that, with a very few exceptions, the disease was confined to the poor and miserable inhabitants of these parishes. Several of the magistrates, the clergy of different denominations, and the benevolent and opulent individuals of these towns are placed beyond the encomiums of the present individual who addresses the public.

Upon the 1st of December, epidemic cholera broke out at Houghton-le-Spring, and at Pensher, about six miles from this town.

It commenced at Newcastle on the 7th, at Seaham Harbour on the 10th, and at North Shields on the 20th.

At Gateshead the disease did not make its appearance till the 25th of December, when only two cases were, on the evening of that day, reported; and so rapid was the course of “the pestilence that walketh in darkness,” that on the 27th of December, 172 patients were reported, of whom 63 had died. In a few days afterwards we find at Newcastle, where the disease had not been heretofore so fatally rapid in its progress, that it renewed its attacks with greater energy than ever. But these being out of my range, I shall confine myself to my proper sphere of action, viz. this town and vicinity.

Upon the 24th of October last, a table was published shewing the number of persons who died of cholera, out of every thousand, in several cities of Europe; the numbers, up to the 52nd day, were as follow.

Riga,31	Dantzic, 9
Posen,17	Stettin,..... 5½
St. Petersburg,...13	Berlin,..... 4¾

On the 5th of December returns were published which gave the following summary of

the state of the cholera at the respective cities mentioned.

At St. Petersburg, total number of cases up to the 13th of November, 9238,—Deaths, 4754.

Vienna, up to the 21st of November, 9664 cases,—Deaths, 1847.

Hamburgh, to the 2nd of November, 855 cases,—Deaths, 448.

I find that in Sunderland, from the commencement of this epidemic, up to the 3rd of January, 1832, the present time of writing, we had of cases, 531,—Deaths, 200.

Newcastle, from the commencement, up to the 2nd of January, cases, 437,—Deaths, 139.

Gateshead, from the commencement, up to the 2nd of January, cases, 269,—Deaths, 83.

North Shields and Tynemouth, since commencement, up to the 2nd of January, cases, 26,—Deaths, 12.

Estimating the population of the united parishes, which go by the general name "Sunderland," at 40,000, we find that we have lost five persons in every thousand, having had 200 deaths. From this we ascertain, on comparing with the above tables, that we are nearly at the lowest ratio of deaths

per thousand, as compared with the cities of the Continent, which have been visited with this plague.

The weather at Sunderland was, generally speaking, from the end of October, and during the whole of the months of November and December following, open, mild, and moist, with the exception of the frost and snow, which, as before-mentioned, occurred upon the 15th of November. During the months of October, November, and December, we did not observe at Sunderland the usual number of cases of acute and chronic rheumatism, pneumonia, or erysipelas. The catarrhal cases were few in number; though in the summer I attended several cases which resembled, in their leading symptoms, the Influenza of the years 1802 and 1803.

The thermometrical changes were regularly taken down by me, but I found out, when too late, that the thermometer I had used, was, upon comparison with two others in my possession, very incorrect. I therefore thought it better to leave out every thing recorded upon that subject, than have anything faulty in a work of this description.

The following table of barometrical changes was drawn up partly from documents kindly presented to me by Dr. Henry Ogden, of this town, and partly from my own memoranda; and I am of opinion, that as far as this table goes, it will be found to be perfectly correct.

<i>Date.</i>	<i>Barometer.</i>	<i>Weather.</i>
30 Oct.	29	Mild clear weather.
31	29·5	Do.
1 Nov.	29·25	Cloudy, and mild weather.
2	29·5	Clear weather.
3	29	Much lightning during last night, cloudy weather.
4	29·5	Cloudy, and mild weather.
5	29	Rain, and cloudy the whole day.
6	28·75	Clear, and serene.
7	29	Much lightning during last night, weather same as yesterday.
8	28·75	The same weather.
9	29	The same.
10	29·5	Cloudy weather.
11	29	Mild weather.
12	29·25	Clear, and mild weather.
13	29·5	Cloudy moist weather.
14	29·25	Do.
15	28·10	Hard frost, wind WSW.
16	29·25	Much lightning last night, snow, and hard frost, wind W.
17	29·25	Hard frost, wind W.
18	29·5	Frost and snow, wind W.
19	19·15	Frost and snow, wind N.

<i>Date.</i>	<i>Barometer.</i>	<i>Weather.</i>
20 Nov.	29·5	Hard frost, wind WNW., evening fresh weather.
21	29·5	Thaw, with rain, wind SW.
22	29·5	Mild weather, wind SW.
23	29·15	Do. wind W.
24	29·5	Do.
25	29·50	Rain, wind E.
26	29·5	Do.
27	30·25	Wind S.
28	30·25	Do.
29	30·75	Wind SW.
30	29·95	Rain, wind NW.
1 Dec.	29·10	Rain, wind NW.
2	29·75	Do.
3	30·5	Do.
4	29·75	Do.
5	29·75	Cloudy weather.
6	29·5	Fine weather.
7	28·50	Rain.
8	28·50	Fine weather, wind S.
9	28·75	Do.
10	29	Do.
11	28·5	Wet weather, wind S.
12	28·5	Rain.
13	28·5	Mild.
14	29·25	Cold, wind S.
15	29·25	More mild.
16	29·25	Do.

The epidemic cholera having made its entrance into Europe, from India, it naturally became an interesting subject of conversation in the town of Sunderland, particularly

when the cities of St. Petersburg, Dantzic, Riga, and Hamburgh fell under its influence. as our ships have at all times been in constant communication with these cities; and, accordingly, early in June last, a Board of Health was established in this town, which was the first Board of Health formed in these kingdoms; George Robinson, Esq., the senior magistrate, was called to the chair, which was a most fortunate circumstance for the town.

Being senior physician to all our charitable establishments, no doubt influenced the medical practitioners of the town to give me an unanimous call to the chair, of the medical department, of our Board of Health.

Upon the minutes of the medical department, I find the first duty we performed was, to assure ourselves of the co-operation of all the medical men of the town, and vicinity, by every means in our power, and accordingly in the following manner we attended to our duty.

18th June, 1831.

Meeting of the medical department, after the general meeting of the Board of Health.

DR. CLANNY, in the Chair,

The following circular to all the medical men of these parishes was agreed to.

“Sir,—Great fears being entertained of the introduction of epidemic cholera into these towns, a committee has been formed to take measures for its prevention, of which you are requested to become a member, and to attend on Monday, at 12 o’clock, at the Commission Room, Exchange Buildings.”

Frequent and numerous meetings of the faculty were held, and many suitable sanitary plans were proposed and adopted. Amongst others the following may be particularised.

“That a document be drawn up to report the institution of a Medical Board, and the object, and that the same be transmitted to the public journals of Sunderland and Wearmouth for publication, of which the following is a copy.

“CHOLERA.

“From the alarming advance of epidemic cholera, towards the western parts of Europe, fears have been entertained of its importation

into this country. The circumstance of vessels trading between this port and those of the Baltic, where the disease prevails, renders it necessary, that every possible endeavour should be used to prevent the introduction of so destructive an epidemic amongst us. Should such precautions unfortunately be unavailing, it will then be necessary to have recourse to those means of mitigating the disease, and preventing its further dissemination, which have been found most successful in other places.

“These considerations have occasioned the institution of a Board of Health, consisting of the magistrates, clergy, medical men, and several of the principal inhabitants of Sunderland, and its neighbourhood. This Board have already had several meetings, at one of which, nearly forty medical gentlemen were present, and no pains have been spared to procure every information tending to throw light upon the subject. With regard to the introduction of cholera, it is sufficient to observe, that the strictest quarantine regulations are at present enforced on all ships arriving from suspected districts.

“But, preparing for its appearance, the Board of Health have given their strict attention to providing suitable places of accommodation for the sick, to which, on the first appearance of the disease, the persons affected may be removed: and where the exertions and skill of the medical attendants will be employed, with the important advantage of a good supply of fresh air, the want of which has always aggravated the severity of epidemics in this town.

“The Board of Health earnestly request, that if any suspicious case of illness should occur, instant application may be made to a medical man, as the loss of a few hours too often renders the disease hopeless.”

Committee Room,

Infirmery, 2nd September, 1831.

DR. CLANNY, in the Chair,

It was proposed and carried unanimously, that the medical department of the Board of Health, recommend to the General Board, the formation of distinct committees, to visit the various parts of the town, and neighbourhood, to inquire into the state of the inhabitants,

as to health and circumstances; to use, in conjunction with the proper authorities, all possible means for remedying the present filthy state of many of the streets and lanes, and to recommend to their inhabitants such measures as may appear advisable for the preservation of health, in conformity with the recommendation contained in a pamphlet transmitted to the Sunderland Board of Health, from the chairman of the London Board of Health.

A sub-committee was formed accordingly, and the town was divided into districts. To each district, one medical man, and three respectable inhabitants were appointed.

I am the more particular on this subject, as many erroneous reports have been circulated upon this very point; and as was emphatically remarked by one of the physicians, at a meeting of the medical department, "We are now girded, and ready to descend into the arena."

About this time, indigenous cholera prevailed to a great extent, in our town and vicinity; and several peculiarities of its symptoms were mentioned at different meetings of the medical department

Several severe, and some fatal cases of indigenous cholera were stated, at the medical department of the Board of Health, to have occurred in the practice of different medical gentlemen, some of whom were members of the Board.

In these cases of cholera, it was remarked, that several new symptoms presented themselves; but as no written details are in possession of the Board, it is out of my power to particularise them further than the following, *viva voce*, remarks—a rapid sinking of all the powers of life, universal coldness of the body, severe vomiting and purging, and, in a few cases, a blueness of the skin.

I was called, by Mr. Dixon, one of our surgeons, to see Robert Joyce, of Cumberland Street, Bishopwearmouth. Though the patient recovered, it was considered expedient to call a meeting of the medical department, to discourse upon this case, to which I had been called.

This person became indisposed upon the 9th of October; and I am thus particular, as I shall have occasion to enter more fully upon this case in the course of this work.

We came to the following resolution, after having heard the case very clearly detailed by Mr. Dixon.

“Resolved,—That the medical department of the Board of Health have received a communication from Mr Dixon, which they think most important, and other cases of previous occurrence, likewise important, having been adverted to, they are of opinion, that there do not exist, at present, reasons for communicating them to the Board of Health.”

A letter was written to me, by Robert Joyce, Jun. relative to his father's indisposition, of which the following is a copy.

“Sir,—On the 8th of Oct. 1831, my father, Robert Joyce, was in good health, till at breakfast-time next morning, viz. the 9th, he felt rather sick, but did not vomit. Soon afterwards was very much purged for about an hour. In a short time he became sick, and had a severe pain across the stomach. He continued in this state till half-past ten, when he was seized with cramps in the legs, thighs, and groins. The cramps, sickness, and purging continued, more or less severe, till night, when he was bled at the arm, from which he was

much relieved. He found great benefit from hot flannels, and boiled vinegar applied to the legs, and he was much inclined to sleep, when the cramps abated; but as soon as he fell asleep, the cramps returned.

“He found much relief by having his legs rubbed by the hand, when the cramps were severe.

“He continued in this way till four o’clock next morning, when he fell into a sound sleep; after which he never felt any more pain or uneasiness.

“I forgot to remark that he was thirsty during the whole time of his indisposition.

“I am, Sir,

“Your’s respectfully,

“ROBERT JOYCE.

“Bishopwearmouth, 29th Dec. 1831.”

The following report was drawn up by Mr. Dixon, and presented me.—“Sunday, the 9th of October, Robert Joyce was seized at six o’clock in the morning, with vomiting and purging of rice water fluid, accompanied with cold skin; slight cold perspiration; cold moist tongue. and cold breath;

livid extremities; the most violent spasm from the toes to the neck, including the arms and hands, with peculiar voice of a husky sound; an anxious countenance; sunk eyes; pulse scarcely perceptible, with great jactitation. Exhibited frequent doses of opium, and calomel, with mixture of magnesia, sp. ammon. co. and peppermint water; frictions of hot vinegar to the legs, and abdomen; and as soon as reaction began to take place, was bled to faintness; the blood was thick, dark, and of a tarry appearance; pulse improved after bleeding; spasms subsided rapidly: and, in fact, the v. s. acted like a charm upon every symptom of the disease; the spasms, in particular, were the most violent and excruciating I have ever witnessed."

The above-named Robert Joyce was visited by me on the 9th and 10th of October, and I found the patient as described by Mr. Dixon. This case interested us, and can never be eradicated from my memory, as it was the first case of epidemic cholera I had ever seen.

The following case came to my knowledge, three months after it occurred, and is most

important, as it was the first fatal case, from epidemic cholera, which took place in this town. In the course of my inquiries, as to the origin of the disease, I was most fortunately directed to the house in which the patient had lived. The house is about a musket-shot from the residence of the Sproats, in the Low Street, near the Fish Quay, and impends over the river on the north, and on the south runs a most narrow dirty street. The occupants appeared to be very respectable, and the house is well-frequented as a public-house.

I found that Mr. Cook, surgeon, of the parish of Sunderland, had attended the case; and, upon waiting on him, he very kindly drew up the case, from memory, which, I am satisfied, from the conversation I had with the patient's family, is as full and correct as possible, considering the length of time which has elapsed since this case occurred.

“Isabella Hazard, aged twelve years, in good circumstances, was suddenly attacked on the 17th October, 1831, with excessive vomiting and purging of a watery fluid, attended with great prostration of strength and unquenchable thirst, eyes sunk in their sockets, features

much altered, a deadly coldness over the surface of the body, with spasms of the lower extremities, the skin remarkably blue, so much so that the mother enquired 'what made the child so black,' as she termed it; pulse imperceptible, tongue moist but chilled, and a total suppression of urine. Was in perfect health when she went to bed, and had attended church twice on that day; she took ill at twelve o'clock at night, and died next afternoon.

"I was called in at four o'clock in the morning, three hours after the attack: ordered a warm bath, brandy and hot water, mustard cataplasms to the calves of the legs, which remained on two hours, without producing any sensible effect; also, a mixture with tinct. opii. carb. ammon. aquæ. menth. Sumat coch. \dot{i} . omni. hora. I visited her again at seven o'clock; no reaction; continued the stimulants; saw her at eleven, apparently dying; she died at four in the afternoon."

I was called, on Sunday, the 23rd of October, to visit William Sproat, a keelman, living near the Long Bank, in the parish of Sunderland, and met there, by appointment,

J. B. Kell, Esq., surgeon to the 82nd regiment, at present in our barracks. This gentleman had seen much of epidemic cholera in the Isle of France, and to him I am greatly indebted for much useful practical information, upon the diagnostic symptoms of this new disease. William Sproat was attended professionally by Mr. Holmes, one of our surgeons, who also met me at the patient's house; and the following is an account of the case as carefully drawn up by that gentleman, at my request.

“William Sproat, aged sixty years, a keelman, employed at the Pier, had been for a week or ten days affected with diarrhœa; but he was not so ill as to be obliged to relinquish his employment. For some time previously he had been in a declining state of health. On Wednesday morning, October 19th, he became worse, and was unable to continue his work. On Thursday evening, Oct. 20th, at 6 o'clock, I was called to him, and found him vomiting and purging, but with no symptom of collapse. The pulse was natural in force and frequency, the skin of the natural temperature, tongue moist and

slightly covered with a white fur, the papilla at the lip and edges not red nor raised, no thirst, and in good spirits; the stools were rather light coloured, but feculent, and neither thin nor frothy. Ordered tinct. opii. gut. lx. and the effervescing mixture. On Friday, Oct. 21st, he was rather better, and sat up at breakfast; pulse, temperature, and tongue, as before, and vomiting only when fluids were taken; stools, as before, quite thick, though light coloured. Ordered tinct. opii. gut. xl. and to have sago and wine, and arrow-root pudding for common diet. At the evening visit he was better. Ordered a bolus of calomel and opium at bedtime, and a table-spoon-ful of castor oil in the morning. On Saturday, October 22d, he was greatly improved; the vomiting had entirely ceased, and he had had only two stools in the night: the pulse was natural. I made examination of the abdomen, and not the slightest uneasiness was produced by pressure. At this time, I considered my patient convalescent, and gave strict orders as to his diet, directing that nothing but farinaceous food should be given; yet, notwithstanding these orders, I found he had partaken of toasted

cheese for supper on the preceding night. After my visit, and contrary to my injunctions, as to diet, he had a mutton-chop for dinner ; and, after dinner, he went to the river to his keel. He was absent about twenty minutes, and on his return home, about four o'clock, he became very ill, had a severe shivering fit and giddiness, cramps of the stomach, and violent vomiting and purging. Although he was in this alarming state, his friends did not send for me until Sunday morning, at seven o'clock, when I found him evidently sinking ; pulse almost imperceptible, and extremities cold, skin dry, eyes sunk, lips blue, features shrunk, he spoke in whispers, violent vomiting and purging, cramps of the calves of the legs, and complete prostration of strength. At this time the tongue was moist and warm, but it shortly afterwards became dry, brown, and cold ; the urine was suppressed. I had not an opportunity of examining the stools, but they were described to me as being like meat washings, and horribly offensive. Ordered the following *t. opii. gr. xl.* immediately, *opii. gr. iss.* every two hours ; brandy and wine *ad libitum* ; a blister to the epigastrium ; hot bricks

to the feet, and to be wrapped in warm blankets. On my next visit I found that the blister had not risen, and that it had been removed: I proposed a mustard cataplasm to the abdomen; but this was objected to, and not applied: I then gave him an enema, composed of starch, tinct. opium two drachms. Two hours afterwards, I visited him again, and found that slight reaction had taken place; the pulse was stronger, his hands were warm, countenance more natural, and he expressed himself as being better; but the other symptoms abovementioned, continued. Ordered to continue the stimulants and hot applications, and to apply a blister to the epigastrium, and to have the enema repeated. On the following morning, October 24th, he was quite collapsed, with aggravation of all the symptoms except the vomiting, which had entirely ceased. At this time, the stools passed involuntarily. Ordered tinct. opii. g. xl. in brandy, immediately, continued the stimulants and hot applications. Towards the evening, the starch enema was repeated without the laudanum. On Tuesday, October 25th, he was less collapsed, the countenance more natural, the

blueness of the lips had disappeared. the vomiting had ceased, but the purging still continued, although it was not so violent as before; the pulse was nearly imperceptible at the wrist, and the extremities were cold, the face and trunk were warm, the spasms of the legs still continued; he expressed himself as being more composed, ordered a table-spoon-ful of brandy to be given every ten or fifteen minutes, and a pill composed of calomel gr. ii. and opium gr. i. every three hours. Towards the evening, he became sleepy, though restless; the pupil contracted freely on presenting a strong light. At this time, the purging had entirely ceased, as well as the vomiting, but the other symptoms continued. On Wednesday morning, October the 26th, he was much weaker; the pulse scarcely beating under the fingers, countenance quite shrunk, eyes sunk, lips dark blue, as well as the skin of the lower extremities. the nails were livid; he was comatose; until the supervention of coma, the intellectual faculties were perfect: at twelve o'clock at noon he died.

“ This case was drawn up from memory on the day after the death of the patient.

“ Signed, HENRY HOLMES.”

I visited this patient two or three times, and have reason to believe that the statement is perfectly correct.

I now proceed to the next case. On the 27th of October, accompanied by Mr. Kell, I visited, by request, William Sproat, son of William Sproat, senior, whose case is detailed above. We found him in a low damp cellar, near the Fish Quay, close to the river, and also to his late father's residence. He had been a few hours only indisposed from this disease.

The attack commenced with vomiting of a copious fluid, tintured with blood. He had been severely purged, and the quantity of rice-like water which he passed was immense. The surface of the body was cold, and the countenance was collapsed. His eyes were sunk in his head. He was dejected in spirits. He passed little or no urine. Pulse 90, and weak, voice subdued; and though he got up from his bed to receive us he appeared greatly

exhausted by the effort, and we desired him to return to his bed. Situated as he was, I considered it indispensable to have him sent to our infirmary, when, by rotation, he became the patient of my colleague, Dr. Miller, who bestowed much attention in his attendance upon him.

This case proved fatal, and the post mortem examination, which was performed by Mr. Penman, the house surgeon, is subjoined. The daughter of William Sproat, secundus, also became, at the same time, a patient of Dr. Miller, in the infirmary, and with much difficulty recovered from the sequela or consecutive fever of epidemic cholera.

Mr. Penman drew up a history of the case of William Sproat, secundus, and also the minutes of the post obit examination, at my request, which I subjoin.

“ William Sproat was admitted into the infirmary on the evening of the 27th of October in the following state :—The extremities cold as marble, pulse just perceptible at one wrist, countenance extremely shrunk, so much so that the integuments of the face appeared

as if drawn tightly over the bones, the eyes had retired to the bottom of their sockets, and were surrounded by a dark blue circle, the lower part of the eyeball extremely injected, whilst the upper part was completely blanched, his voice was alternately hoarse and whispering; there were present continual nausea and jactitation, frequent vomiting and purging of a serous fluid, in which were floating little threads of fibrin; also cramps in the arms and legs. A vein was freely opened and about four ounces of thick black blood was extracted, which, on being left at rest, appeared like jelly, no serum being separated. He was put into a warm bath, the temperature of which was raised to 126°. Ten minutes after his leaving the bath, I found him, if possible, colder than before, without pulse at either wrist. Brandy and opium were ordered him, and hot substances applied to different parts of the body. From this time he gradually rallied, and on the following day his skin was warm, the pulse perceptible, though still extremely weak, the vomiting and purging, also the cramps, had entirely ceased. On the 29th, the extremities had again become cold, and his pulse

scarcely perceptible ; his countenance put on the appearance of that of a drunken man ; he could with difficulty be kept in bed, and was continually muttering to himself, and, on being roused, he replied that he had no pain anywhere. On the 30th, he still presented that kind of drunken debauch ; was extremely restless, and continually biting the bed-clothes, or any other object near him. On the 31st, he fell into a state of coma, with stertorous breathing ; and, on the afternoon of the same day, he died.”

At eight o'clock in the evening, four hours after the death of Sproat, a nurse of the general wards of the institution assisted in binding and carrying the body to the dead-house, and at two the next morning was attacked with cholera.

This person's name was Eliza Turnbull, whose case is about to be recorded.

Post mortem appearances of William Sproat, Jun., as performed and drawn up by Mr. Penman, surgeon, on Monday, the 31st of October.

“The muscles of the lower extremities and of the abdomen were still in a state of contraction; the veins were defined by lines of a purple colour; the fingers shrunk, and their integuments corrugated; eyes deeply sunken, and surrounded by a livid circle.

“On opening the abdomen, the intestines, with the exception of the colon, which was contracted, were distended with flatus, and thin vessels gorged with blood; stomach healthy, with the exception of a small patch of ecchymosis internally; mucous membrane of the intestines of a deep red colour, and very easily lacerated; rectum containing a considerable quantity of green fluid; the bladder contracted to the dimensions of a walnut, and containing a small quantity of fluid like gruel; liver healthy; gall-bladder full of healthy-looking bile.

“The lungs were gorged with red blood; the heart large and flabby; right ventricle and the vena cavae distended with black, uncoagulated blood; left ventricle and aorta containing no blood.

“On removing the skull-cap, the dura mater was uniformly smeared over with blood,

arising from the rupture of numerous vessels passing between it and the skull. On dividing the dura mater, a considerable quantity of water escaped. The arachnoid membrane was thickened ; the vessels of the pia mater gorged almost to bursting ; the brain was in such a state of congestion that, on slicing it, the cut part was instantaneously covered with blood, which, on being rubbed off, again appeared ; the ventricle contained a few drachms of water ; the vessels of the pons varolii, and medulla oblongata were extremely turgid, and the latter body very much harder than natural."

The next case I will insert is that of Margaret Sproat, daughter of William Sproat, secundus, which, at my request, Mr. Holmes drew up for me.

The detail of symptoms and treatment which were adopted at the infirmary are not of sufficient interest to induce me to enter them on the pages of this volume.

"Margaret Sproat, aged 10 years, on the 26th of October, was suddenly attacked with

vomiting, cramp of the stomach, and prostration of strength; purging supervened shortly afterwards. At first the discharges consisted of the contents of the elementary canal, but they became subsequently like barley water.

“I was called to her about an hour after these symptoms appeared. I ordered her to be wrapped in warm blankets, and frictions to be used; wine was also given to her occasionally, and the following medicines prescribed. *R. tinct. opii, gut. xii. Aquæ puræ, unciam. M. ft. haustus statim sumendus. R. sodæ carbonat sesquidrachmam. Tincturæ opii, gut. xl. Aquæ puræ, uncias sex. Sumat coch. ii. majora e coch. i. succi limonis omni hora. Applicetur emplastrum cantharidis epigastro.*

“Under this treatment she became convalescent on the following day, October 27th, from the cholera symptoms, and the case degenerated into fever. On the evening of October 27th, she was removed to the infirmary, and placed under the care of Dr. Miller.”

I was called from the post mortem examination of William Sproat, secundus, to attend our chief nurse in the infirmary, for whom I

entertained much respect. When I saw her, which was about 9 o'clock A. M., she was in a state of collapse ; she did not know me—indeed she appeared to be verging on eternity.

From the kindness of Mr. Penman, I am enabled to lay this case before the reader.

“ Eliza Turnbull, a strong healthy woman, and one of the nurses of the infirmary, was taken ill yesterday morning, October 31st, about one o'clock. Between four and five, A.M. I was called, at which time I found her affected with the following symptoms :—Violent vomiting and purging of a watery fluid, similar in appearance to oatmeal gruel ; excruciating spasms in the muscles of the legs and arms, especially the former ; pulse only perceptible at one wrist ; voice puerile ; tongue cold ; extremities cold, and of a livid hue ; fingers and toes much shrunk ; intellect perfectly clear ; complaining of pain in the region of the stomach, and calling for cold water. A vein was opened in each arm, from which flowed only a few drops of blood, like treacle. External and internal stimulants, with opium, were freely used, without effect. About ten

A. M. the cramps had nearly ceased ; the skin became universally cold as marble, and, at the epigastrium, of a deep purple hue : from this time till two P. M. (the period of her death) the only symptoms of life were a gentle heaving of the chest, and the rational answer to any question proposed to her.

“ It may be necessary to state that she had no other communication with any person labouring under cholera, than in assisting, the preceding evening, to remove, from the fever-house to the dead-house, the body of a person who had just died of that disease.”

The body here alluded to was that of William Sproat, secundus, whose case is previously recorded.

The next case, according to date, is that of Robert Roddenbury, aged 35.

“ The subject of this report was an industrious shoemaker, of temperate habits, residing in a wretched hovel, with a large family. He had been for some time liable to stomach complaints. On Sunday, the 30th of October, he dined and supped on pork, drank no fermented liquor, and went to bed well.

“ At midnight, he was attacked with vomiting and purging of a fluid, resembling water gruel, which filled several chamber-pots; violent cramps of the whole body, affecting the different fingers and toes successively; his voice was quickly reduced to a whisper; nails blue, skin livid, and covered with cold sweat; pulse at the wrist imperceptible; he was visited by an irregular practitioner, who administered brandy, æther, and laudanum. At 9 A. M., on Monday, the spasms had ceased, and the only complaint he made was of pains in the region of the heart; his mental faculties continued quite perfect, till 12 o'clock, when being, at his own request, raised up, he instantly expired. His attendants believe that he did not pass any urine.”

The above report was given by an intelligent friend of the patient, who had attended him during the attack.

Examination—“ 1st Nov. 8 A. M. 20 hours after death.—Skin of extremities livid, nails blue, muscles extremely rigid, limbs inflexible, toes and fingers, some firmly flexed, others as firmly extended, thorax did not con-

tain a drop of serum, in fact, all the serous membranes were remarkably devoid of moisture; the lungs were posteriorly infiltrated with black blood, otherwise healthy.

“On opening the pericardium, the interior and superior *vinæ cavæ* were observed greatly distended: these vessels and all the cavities of the heart were gorged with blood, of a black colour, and resembling tar; the blood was adhesive to the touch; and when the ventricles were laid open, they appeared as if treacle had been poured over them; the right ventricle contained a large fribrinous concretion; the substance of the heart was soft, and had a dull leaden shade of colour; liver healthy, gall bladder much distended; the ducts empty, and pressure on the gall bladder did not force out any of its contents; the resistance was caused by a contraction, half an inch in length, commencing at the origin of the cystic duct, preventing the passage of a probe, and of air from a blow-pipe: the bile was tenacious, and of a deep yellow colour: spleen nearly natural, its vessels containing much black blood.

“ Stomach—The superior serous surface was of a brown red, which, on the under surface, affected only the cardiac extremity. The stomach contained a quantity of fluid like gruel, though a little darker, apparently from being mixed with brandy, of which the smell was perceptible; the mucous membrane was thickened, and so soft as to be easily peeled off, and torn with the nail, at the pyloric extremity, it exhibited a speckled redness. The prominent parts of the corrugations exhibited a black tinge, as if a paint brush, dipped in Indian ink, had been passed lightly over it, and some streaks of the same colour were observed on other parts.

“ The duodenum contained a fluid similar to that in the stomach, but of a lighter colour, and just at the entrance of the biliary ducts, a slight tinge of blue existed. On continuing our examination downwards, the fluids became much whiter, precisely resembling a strong solution of soap, and where thinner of whey, containing numerous white flocculi.

“ In the caput cæcum coli, the fluid had much resemblance to pus, but was not granular, but adhesive. The arch of the colon was much

contracted, and contained some of the same matter, in a less fluid state, which, in fact, was the case to the rectum. In all the examination, not the slightest trace of feculent or bilious matter was observed, except as mentioned above, in the duodenum.

“Urinary bladder hard, and strongly contracted, containing about two drachms of a fluid, similar to that of the intestines, with a slight urinous smell.

“Kidneys firm, vessels distended with black blood; pancreas firm; all the great veins enormously distended.

“The extreme rigidity of the muscles was particularly observed in the psoas, which felt as hard as a board.

“Permission to examine the head was not obtained.

“Signed,

“THOMAS REDDISH TORBOCK, M.R.C.S.”

Mr. Torbock invited me to attend this dissection, which was out of my power, and he gave me the written documents, in the most handsome manner. the moment they were drawn up.

The following case, in a corrected form, was presented to me by Dr. Miller, for this work.

“Thomas Wilson, keelman, aged 51, a man of regular habits, was attacked on the morning of the 31st of October, about 4 o'clock, with vomiting of a fluid resembling rice water, and copious dejections of a similar fluid, accompanied with severe abdominal pains, and spasms of the extremities. Mr. Cook, surgeon, was called for at 6 o'clock, and immediately gave him, by spoonsful every half-hour, a six ounce mixture, containing two drachms of the carbonate of ammonia, and one drachm of laudanum; he was first put into a warm bath. At 7 o'clock I was called to visit him; pulse at this time not distinguishable at the wrists; skin over the surface of the body, cold as death; lips blue, eyes dim, and sunk in the head; did not vomit; complained of intense pain in the epigastrium and abdomen, with cramps of the extremities; had one dejection resembling rice water, or of milk, largely diluted with water, of a peculiar sickening and highly offensive smell, something like putrid animal matter; extreme restlessness; moaning and sighing; speaks in

a whisper ; intellect clear and perfect ; tongue moist and cold ; respiration slow ; eye-lids half open ; urine suppressed ; hot bottles applied to the feet, with assiduously rubbing ; one drachm of tincture of opium, and twelve grains of calomel, were instantly given ; mustard plasters were applied over the whole surface of the abdomen, and to the legs and feet ; warm brandy and water were given frequently ; the mixture with ammonia continued ; the spasms ceased about 9 o'clock ; no vomiting or purging ; there appeared a total loss of power of the nervous and circulating systems, and it appeared evident that the man must die. I left him, and saw him again at 12 o'clock ; had the appearance of a *living corpse* ; eyes deeply sunk in their sockets ; hand and fingers remarkably shrivelled, very much reduced in size, of a light blue tinge. He gradually got worse, and expired at 3 o'clock in the afternoon, having lived exactly eleven hours after the attack.

“ JOHN MILLER, M. D.

“ Physician to the Sunderland Infirmary.

“ And H. P. Royal Navy.

“ Bishopwearmouth. 2nd Nov. 1831.”

It was agreed by the medical officers of the infirmary, assembled at the post mortem examination of the body of William Sproat secundus, that a meeting of the medical department of the Board of Health, should be summoned for one o'clock the following day, viz. Tuesday, the 1st of November; and also a general meeting of the Board of Health, an hour after the meeting of the medical department.

The medical department met accordingly, at the appointed hour. I was in the chair. Five cases of cholera were reported at the meeting; four of whom had died in a short time, and the fifth lay at the point of death; when the following query was put from the chair to the meeting, without comment.

Is it the opinion of the medical gentlemen present that we have the continental cholera amongst us? Those who are of this opinion will hold up their hands; when it was carried unanimously.

Next—Those who are of a contrary opinion will hold up their hands? when not one hand was held up.

A general meeting of the Board of Health took place soon afterwards,

GEORGE ROBINSON, Esq. in the Chair,

The following resolution was agreed to unanimously.

Resolved—That medical gentlemen, under whose observation cases of cholera have fallen, draw up a full report of them, and place them, by the forenoon of the 2d instant, in the hands of Dr. Clanny, to be transmitted by him to the Board of Health of London.

This resolution was carried into effect by the present writer, and the town of Sunderland was immediately placed under quarantine.

At first, our epidemic appeared only in certain streets, or lanes, viz. the Fish Landing, Long Bank, Silver Street, High Street, Burreigh Street, Mill Hill, Sailors' Alley, Love Lane, Wood Street, Warren Street, as also in several lanes in Bishopwearmouth, the New Town, Ayre's Quay; and, on the north side of the river, as Monkwearmouth, in several of the bye-lanes near the river.

We had a Cholera Hospital established, but, unfortunately, a post mortem examination

having been made in that institution, under particular circumstances, a rooted prejudice prevailed against this valuable charity, which prevented the relations of persons affected with cholera from consenting to their removal to it; though the superiority of this institution over the badly-ventilated and comfortless dwellings of the poor was known to all the town, by a statement of the advantages it afforded.

At our infirmary two wards had been, as it were, set apart, for epidemic cholera, long before its appearance in the town, and several patients, who were removed to it, were happily restored to health.

It is a melancholy fact that, though the chances of recovery for epidemic cholera patients were clearly explained, and the numbers given, nevertheless the same prejudice attached to the infirmary as had prevailed in regard to the Cholera Hospital.

In these affairs the Board of Health used every effort to stem the current of popular prejudice; and Doctors Daun, Gibson, and Macann, who resided here at different periods as government commissioners, and members

of the board, used every effort, conjointly with myself, the medical member of the board for the town of Sunderland, without being able to effect a third part of what we desired to accomplish. I hope this will be a caution to medical men in other towns, for if, from any cause, a prejudice take root, under similar circumstances, years will be requisite to eradicate it.

During the progress of the epidemic, we had many distinguished professional visitors from London, Dublin, Edinburgh, Leeds, Liverpool, Manchester, Birmingham, Belfast, Perth, and other large towns.

Professor Majendie was deputed to investigate the epidemic cholera at Sunderland by the French Government, and by the Institute of France, of which he is a distinguished member. Our professional brethren who visited Sunderland conducted themselves with much good sense, discretion, and humanity.

I never remember our town in so filthy a state as it was in the months of November and December ; and, without doubt, the quarantine restrictions on our trade did not con-

tribute to the diminution of these existing causes of epidemic cholera.

We observed that the disease lingered, if I may be allowed the expression, in certain streets and lanes, some of which were open, some confined. Generally speaking, the disease fixed its residence in such places as medical men could have pointed out *a priori*.

It appeared to us that the atmosphere carried pestilence with it, as several persons were as suddenly affected by it as if they had been paralysed by lightning.

We remarked that during the night, from one to four o'clock, A.M. was the time at which most persons first felt the commencement of the disease.

Could this have any identity with an atmosphere highly vitiated by carbonic acid? Such, undoubtedly, our poor neighbours too frequently breathed in the night-time; and so sensible was I of the night attacks of cholera, and remarking the prevalence of black blood of patients, generally, whatever their diseases might be, that I kept my bed-room door at least one inch open every night during the months of November and December last.

These were the only premeditated precautions I ever attended to, during this visitation. I requested others, over whom I had influence, to do likewise.

About the end of November, the epidemic made its appearance in the Sunderland Work-house by an almost simultaneous attack on five old people, who were resident in different parts of the building. I happened to visit these patients when they were in a state of collapse, after the blood had been robbed of its serum from vomiting and purging. With two of these, females, the pulse beat twenty times per minute, the hand shut on the medical thermometer indicated 20° , and the mouth when closed, upon the bulb of the thermometer, indicated, the one 28° and the other 29° .

The skin of one of the females was blue, except innumerable small spots of an orlean plumb colour, which shewed distinctly to the eye that the oxygen of the atmosphere had at these points abstracted the free carbon of the stagnant blood, through the coats of the blood-vessels, and common integuments, similar to what we observe upon the crassamentum of the blood when it changes its dark tint to a

bright red, from similar agency, even through a column or portion of serum.

These females were both perfectly calm and resigned to their fate : they died a few hours afterwards.

In an adjoining room lay a beautiful female infant, only two years of age. When I saw her she appeared in the sleep of death ; her cheeks shewed such a tint as I never saw before, being scarlet with a dash of pink—quite unnatural—still I expressed hopes that she might recover, and I was not mistaken. I had at that time performed many experiments on the blood, and it struck me that, in this child, there appeared a likelihood that the blood would part with its free carbon to the pure atmosphere of this ward. At the workhouse, at that time, there were near one hundred and forty inmates, fifteen of whom died of epidemic cholera, including the sister-in-law and, afterwards, the master of the workhouse himself. This person had been for many months, from every appearance, obnoxious to apoplexy ; and, as I had known him from his boyhood up, I warned him on this point at different times previous to his

attack of cholera. I understand, from his professional attendant, that his was the epidemic cholera of rapid type, or “*la cholera foudroyante*” of French authors.

As, in such cases, the patients seldom lived more than twelve or fourteen hours after the attack, the relations and friends of the patients, being astonished at the new phenomena, were too apt to crowd round the sufferers, and many of them had reason to rue their temerity. But it was whilst performing the last sad offices for the dead, that contagion shewed its greatest force, and such cases in this town were astonishingly numerous, so much so, that it is quite unnecessary to particularise them. Such of the faculty of this town as believed that we had epidemic or spasmodic cholera amongst us, will bear me out in this remark.

At an early stage of our visitation, in consequence of information kindly furnished me by Lieut.-Colonel Rowles, E. I. S., I put the clergymen, and others who were likely to be near the dead, upon their guard, and shewed the impropriety of taking the bodies of cholera patients into our churches, in the per-

formance of funeral service; and carriage by ropes from the hand, or by suitable conveyances, were strenuously recommended, and I hope, as often as could be, were put into practice. In these arrangements the Board of Health shewed much anxiety. Many medical men of Sunderland are impressed that our first attack of epidemic cholera was directly owing to atmospheric distemperature; but how or when that state of atmosphere commenced, no man can say. It appeared to me that we all felt this atmospherical influence one way or other.

In the month of August last I experienced a severe attack of diarrhœa, which continued nearly a fortnight; I did not check it, but watched its progress attentively, considering that it might be serviceable to me, particularly as I have generally too much blood circulating in the head.

During the prevalence of the epidemic in the month of November, I had two attacks of cramps and spasms; first in the inferior extremities, and some time afterwards in the abdomen, from which I can form a pretty accurate notion of what persons afflicted with

epidemic cholera experience, when the disease is of an intense description.

It was rather ominous that the chief nurse at the cholera hospital, as well as the chief nurse at our infirmary, died of epidemic cholera, both of whom I regretted, as they were respectable and trustworthy individuals.

The Board directed that the bodies of all persons who had died of epidemic cholera, be buried within twelve hours. The bed and body linen, &c., round the patients, were always directed to be burnt. Similar articles, of at least equal value, were presented to the poor families in return. The usual precautions as to ventilation and washing were most rigidly put in force, and the houses in which persons had died, were ventilated, scrubbed, and lime-washed.

The streets, lanes, water courses, and common drains, were cleansed; and collections of filth were carefully removed.

Chloride of lime was extensively used, as a preventive, but not so injudiciously as to injure the lungs or digestion. But the great value of the chloride had its origin from the confidence and implicit faith with which the

community regard this nostrum, and which, in my opinion, is inferior in value to simple chlorine.

The true prophesy of Dr. Burne, and of Mr. Orton, in the following extracts, deserve honourable mention in a work of this nature

“I have lately witnessed the scarlet fever attack by a violent vomiting and purging, which have sunk the powers of life, and lowered the temperature of the body to a degree that has never been recovered. These data lead me to the conclusion that the present season generates a predisposition to epidemic disease, which would not only favour the introduction of the cholera by infected persons, and the propagation of it, when introduced, but would even go far to generate the disease.”*

“I have also the authority, *viva voce*, of Dr. Clanny, for the most unusual prevalence and malignancy of cholera at Sunderland, during the present autumn. It is greatly to

* Vide Dr. Burne's dispensary reports for June last.

be feared that these are but the skirts of the approaching shower. This unusual prevalence of common cholera remarkably accords with the same fact, as already stated, occurring on the peninsula of India the year before the epidemic reached it, and when Bengal was actually suffering its ravages.”*

When the disease first broke out in this town, it shewed “the rapid type.” Medical persons, from the poor people not knowing better, were, generally, not called in till vomiting and purging had reduced the patient to the deadly collapse ; and when we hold in remembrance the wretched abodes of the poor, the vitiated air, and uncleanly habits of most of them, it is not to be wondered that so few of them recovered from the first shock of the disease : besides, all the world now knows that, on the first impulse of epidemic cholera in any town, the mortality has generally been the greatest. Let us take into consideration the facts stated, and hold in remembrance that the inhabitants were not

* Vide Mr. Orton’s valuable work on epidemic cholera.

seasoned to the cholera atmosphere. One thing I must remark in corroboration of these facts, viz. that, in most persons who were bled at the time of our visitation for other diseases, the blood shewed an unusual dingy tint ; and, as one of my colleagues remarked to me (after we had ordered blood-letting to be performed upon a young lady), “at this moment every inhabitant in this town has dark blood circulating in his system.”

In my opinion, it will be most suitable that I now enter upon the subject of respiration, so that, when we come to the etiology of the disease, we shall more readily understand the application of some new views upon respiration, which I am about to lay before the reader.

RESPIRATION.

The state of the atmosphere—the state of the lungs—the state of digestion—the state of the mind, as well as the influence and agency of several diseases, as far as regards the function of respiration, have not heretofore been sufficiently attended to, and studied by the medical profession.

In our anxiety to reduce our observations to the evidence of our senses, we have forgotten the necessity of direct chemical experiments, to enable us to explain the phenomena of the functions of animal life, and to such neglect we may trace the origin of the false theories, unsupported inferences, and bold assertions of the profession, from all times till the present moment ; hence the slow progress of sound doctrines, as regards medical science.

In my day I have known several men who have held considerable rank in the profession, with whom facts and truth were not regarded, when certain theories were to be observed, or certain ends to be accomplished ; hence the contradictions in even the most common every day occurrences which obtain amongst the faculty ; and this must ever be the case till medical men become more just and honourable. The worst of it is that this laxity, as it regards truth, too frequently influences the actions of medical practitioners, from the highest to the lowest grades, and hence the meanness and time-serving conduct of many medical men---physicians becoming the ready tools of general practitioners, and general

practitioners playing the same game to their employers.

It is a painful subject, but it is too evident that the sooner we are inclined to assert our honest integrity, as professional men, the sooner we shall be enabled to develop the hidden mysteries of nature, and, consequently, adopt appropriate methods of cure for the diversity of diseases which belong peculiarly to the human species.

An indulgence in these expressions may appear peevish, but such is not the case as applies to the present writer, his views being, at all times, directed to the legitimate advancement of medical science.

Respiration could not be investigated, either physiologically or pathologically, till our time; as, formerly, sufficient data were not afforded for our inquiries into the nature of this most important function.

In order to give an impression of the importance of well-regulated respiration, in a general point of view, I shall, in imagination, place before me a male of the sanguine temperament, free from disease, and in the prime of life. We shall suppose that such a person

is, at all times, uniform in the performance of respiration, and of sanguification, and that digestion is also, *cœteris paribus*, in a good state.

When he walks out on a clear frosty morning, he is cheerful, lively, and happy. The air is pure, and the free carbon readily finds an exit from the mass of blood into the air-cells of the lungs, and abundance of carbonic acid is readily formed in these cells, and animal heat is kept up in a most suitable manner; the circulation is equalised, and the powers of the mind, as well as the strength of the body, are invigorated.

Observe the same individual on a sultry, close, and clear day, and such sometimes occurs in our climate in the months of July or August, we shall find him languid, exhausted, and unnerved. His respiration is performed with difficulty, in consequence of the expanded state of the atmospheric air. The blood crowds the centre of the circulation, and, consequently, at this period, the functions of life, as well as those of respiration, are badly performed.

Observe the same individual on a raw December day, when the atmosphere is in that state which conveys more danger to the human body than any other, by reason of its carrying off the heat of the system as fast as it is generated, we shall find him discontented, unhappy, languid, the countenance collapsed and cold, and he is at this moment liable to pulmonary diseases, acute and chronic rheumatism, erysipelas, indigestion, and fevers of all descriptions.

At the same time, it may be remarked that, if a person of the sanguine temperament be more liable to the first class of diseases, enumerated above, he is less liable to every description of fever. Now, all these changes depend, in a great measure, upon the state of the respiratory function, as influenced by the atmosphere; and this state deserves, at all times, our most attentive consideration.

Let us now observe the state of this person under the influence of wine or spirituous liquors—say after he has ingurgitated a bottle and half or two bottles of wine. At first, through the direct influence of the solar plexus of the great sympathetic, and eighth

pair of nerves, blood is gradually sent in excess to the brain ; the eyes become suffused ; the respiration participates in the same apoplectic state, and the blood becomes darker from the free carbon not having a ready exit from the lungs.

If this individual give himself up to such gross sensuality, things go on worse and worse, till (confining ourselves to the respiratory functions) apoplexy, sooner or later, closes the scene. I need scarcely remark that, in such cases, the arterial blood becomes charged with excess of free carbon, and acts on the sensorium commune and coronary arteries of the heart as an extinguisher to vitality.

From certain experiments, I find that, upon an average, most individuals inhale twenty cubic inches of air into the lungs at each natural inspiration ; that twenty respirations are performed each minute ; that the volume of air expired is nearly equal to that inspired ; and that the only evident change which takes place from respiration is the saturation of a certain portion of the oxygen of the atmosphere with the free carbon of the blood in the air-cells of the lungs. In my opinion, the

nitrogen of the atmospheric air serves to dilute the oxygen, if I may so express myself, by which means the oxygen does not act so powerfully, and thus serving as the medium by which the oxygen comes more suitably into contact with the membrane composing the air cells of the lungs. Atmospheric air, after having been once only admitted into the air cells of the lungs, in the process of respiration, returns charged with 3-45 per cent. of carbonic acid, according to Dr. Prout's experiments.

It has been ascertained, that the moment air is inspired, it comes into immediate contact with the air cells of the lungs; whilst at the next expiration, a portion of the air, which had just been converted into carbonic acid in the air cells of the lungs, is given out. It has been proved, that the lungs are manufactories of carbonic acid; and when it is inferred that respiration, like combustion or fermentation, is a calorific process, the inference is not only supported by strong analogies, but grounded upon a steady and settled principle.

It has been supposed by some philosophers, that animal heat is a secretion, depending

upon the brain and nerves. But the admitted facts that oxygen gas has a greater capacity for heat than carbonic acid, is never generated, without being accompanied by the evolution of caloric; that this gas is formed in large quantities during the process of respiration, whilst, at least, an equal quantity of oxygen gas disappears; that young animals generate less heat, when less oxygen is used by them, or afforded them; that the temperature of hybernating animals is found to be a few degrees only higher than the atmosphere in which they hybernate; that the temperature of all animals, whether hot or cold blooded, is directly proportionate to the quantity of oxygen which they inspire; and, finally, that those periods of the day in which oxygen is used in greatest quantity, are the very periods at which the animal heat arrives at its highest degree. When we hold in remembrance the rapidity with which the blood is conveyed through the whole system, we shall be enabled to comprehend that equalisation of animal heat which obtains in the human body.

During the process of respiration, there is a constant exhalation of water from the lungs.

in the form of vapour, which, when condensed, is estimated at nineteen ounces per diem.

From the recent experiments of Professor Majendie, we are compelled to admit that this vapour proceeds from the pulmonary artery, as also from those arteries which are distributed over the mucous membrane of the air cells of the lungs.

From sufficient data, it has been calculated, that in the interval of twenty-four hours, not less than eleven ounces of carbon finds its way from the venal blood into the air cells of the lungs, and, as mentioned above, is converted into carbonic acid.

I instituted a series of experiments last summer, assisted by Mr. Penman, in order to satisfy myself whether human blood contains any other gas than carbonic acid; and I came to the conclusion, that no gas of any description is to be found in either venal or arterial blood, except carbonic acid.

From the recent and valuable experiments of Professor Mitchell, of New York, (of the accuracy of which, from my own experience with bladders, I can vouch) we know that

carbonic acid finds its way very readily through the mucous membrane of the lungs, as is well illustrated by his experiments upon the lungs of a *testudo serpentaria*, which he extracted from the animal, and inflated, respectively, with common air, and carbonic acid.

He then surrounded them with bell glasses, one containing atmospheric air, the other carbonic acid; so that common air surrounded the lung containing carbonic acid, and vice versa. The lung which contained common air, soon burst by the infiltration of carbonic acid, while the other collapsed by its escape.

We find, from the experiments of the same philosopher, that ammonia transmitted in one minute as much in volume as sulphuretted hydrogen in two minutes and a half; cyanogen, three minutes and a quarter; carbonic acid, five minutes and a half; nitrous oxyd, six minutes and a half; arsenuretted hydrogen, twenty-seven minutes and a half; olefiant gas, twenty-eight minutes; hydrogen, thirty-seven minutes and a half; oxygen, one hour and fifty-three minutes; carbonic oxyde, two hours and forty minutes.

Nitrogen has a rate of penetration so low as to be difficult to ascertain, because there is no gas of a lower rate, with which to compare it.

The above are the results of a multiplicity of well conducted experiments upon this important subject.

From this, we at once understand that the cubic inch of carbonic acid, which every sixteen ounces of venal blood contains, (according to my analysis, as published in my treatise on typhus fever) is regularly conveyed to the blood through the parietes of the air cells of the lungs in which it is formed, in the process of respiration; and this transmission of carbonic acid into the blood, accounts for that loss of oxygen which we all know takes place in the said process.

We understand from what is stated above, that the transmission of oxygen, through membranous substances, is to that of carbonic acid, as one hour and fifty-three minutes, to five minutes and a half; and the transmission of nitrogen, is still slower.

These facts, corroborative of my experiments, at once demonstrate, that no other gas, beside carbonic acid, can be contained in the blood

of any human being, without inducing severe disease, or death; and we may rest assured that disease will supervene, when there is excess of free carbon in the blood.

In some severe cases of epidemic cholera, I held a mirror before the mouth of the patient, and could observe little or no condensed halitus.

I experimented with the apparatus invented by Dr. Prout, and found that the exhaled air from the lungs, in most instances, was returned to the atmosphere, with, about one per cent. only of carbonic acid.

We shall now proceed to consider the function of respiration in a restrained state, from whatever cause it may have its origin.

The whole of the blood is received and transmitted through the lungs, in order that it may part with its free carbon, in the process of respiration; after which, it is fitted for the due performance of the duties of assimilation, secretion, and excretion, as it circulates through the whole system.

It is well known that no organ in the human body is more frequently affected with hyperaemia, in its different forms and degrees.

than the lungs. Congestion of the lungs from a state of atony of the blood-vessels of that viscus is frequently met with.

Need we instance the asthenic state of the parenchyma of the lungs, during the last moments of existence?

Is it not evident, in such cases, that the blood driven into the extreme branches of the pulmonary artery, or into the minute ramifications of the pulmonary veins, no longer receives from these vessels the impulse that should propel it onwards to the left side of the heart. The lungs become, in consequence, gorged with blood, just as in those animals in which the eighth pair of nerves were divided, or in persons seized with apoplexy.

In all these cases the activity of the capillary circulation is diminished, by reason of the weakened energy of the nervous system.

The morbid appearances on post mortem examinations are an accumulation of the blood in the vessels, and we find in the small bronchial tubes, a large quantity of serous fluid, which had been filtered from the blood.

The veins of the lungs absorb, and carry such substances as are found in contact with the spongy texture of the lobes of the lungs, to the heart.

We all understand the effect of air, impregnated with odoriferous particles, when inhaled. In some instances, we have pleasurable sensations; in others, the contrary; in others, a tendency to sleep is induced; in others, to apoplexy; and in others, to fainting.

When we inhale mercury in a gaseous state, we find that ptyalism is very readily induced thereby.

In the function of respiration, a five-fold process is carried on at the same time.

1st. The blood gives out its free carbon, and thereby becomes arterial blood.

2nd. The formation of carbonic acid in the air-cells of the lungs: hence animal heat has its origin, which, by the rapidity of the circulation, is distributed to the whole system, no doubt assisted by the co-operation of the brain and nerves—by the actions of digestion, assimilation, and secretion, as well as by the friction of the blood upon the inner coats of the arteries and veins.

3rd. The newly formed carbonic acid is, in its turn, every moment taken into the blood, as explained above.

4th. A quantity of aqueous vapour is discharged from the lungs, but this is rather to be considered as the result of secretion, or transudation, than as a proper effect of respiration; for were it the vehicle (as has been supposed by some philosophers) for conveying the free carbon of the blood into the air-cells of the lungs, all performers on wind instruments would have blood of a bright hue circulating in the veins, similar to arterial blood; but we know the contrary to be the fact. In my opinion, the vapour keeps the air-cells, and the bronchia, in a properly moistened state, by which they are, to a certain degree, fortified against sudden and severe changes of the weather, &c., whilst the temperature of the lungs is, by this halitus, suitably and uniformly regulated.

As heat is generally evolved by the formation of carbonic acid, it is conceived that this is the chief source of animal heat.

It is accordingly conceived, that the heat thus evolved is taken up, probably as specific

caloric, by the passing arterial blood, and distributed by it over the system, probably at the points where it again becomes venal.

Respiration influences the circulation, as we know from the investigations of several eminent physiologists.

Deleterious gases, medicated substances suspended in the air, contagious miasmata, protoxyde of nitrogen, and sulphuretted hydrogen, produce wonderful changes in the human body. The mode in which this absorption is effected, is as little understood as general venous absorption. If the body be supposed to possess thirty pounds of blood, and the heart transmit at each contraction two ounces, and to contract seventy-five times per minute, we shall find that the whole mass of blood will pass through the lungs once every three minutes, or twenty times per hour.

As it has been proved, by direct experiment, that the blood acquires at least *one* degree of heat in passing through the lungs, it necessarily follows, at this moderate calculation, that the system receives twenty degrees of heat in one hour, or two hundred and forty degrees every twelve hours. If the respira-

tion be accelerated, and the contractions of the heart be increased to one hundred, the mass of the blood will circulate through the thoracic organs in one-fourth less time than is stated above, and, consequently, the temperature will be augmented one-fourth, and vice versa.*

The following description of the lungs by Professor Monro, gives an accurate idea of the provision which is here made for exposing a large surface of blood to the action of the air. "As our lungs in a full inspiration contain about 220 cubic inches of air, the whole internal surfaces of the lungs will be nearly equal to 440 square feet, or nearly thirty times greater than that of the whole external surface of the body."

From well conducted experiments, we know that the serum of blood has a strong solvent power over carbonic acid, and with the help of a little agitation, it will very soon absorb more than its own volume of this gas.†

By the direct and indispensable agency of this gas, the blood circulates freely and regu-

* Dr. G. C. Holland.

† Professor Christison.

larly in the large vessels of the circulating system.

In the capillaries, I am well assured that the influence of the carbonic acid is also most important in facilitating the circulation of the blood in these vessels.

Capillary circulation, in a state of health, may be considered as independent of any power derived from the heart or arterial system; but, in a state of disease, it is still further removed in its relations.

We know that in general the circulation is very materially influenced by the capillaries, not merely as one of the means employed to propel the blood along the vessels in its ordinary course, but also as the power by which all the subordinate changes in the state of the circulation are principally effected. When the blood entirely loses its carbonic acid, as in epidemic cholera, the circulation in the capillary vessels ceases, and soon afterwards the larger branches in the arterial system are in a quiescent state, and blood is no longer circulated within them.

The value of carbonic acid in the capillary circulation must be evident to every patholo-

gist, though this is the first time, as far as I know, that the fact has been publicly stated.

If respiration be diminished from any cause, we find that there is a diminution of animal heat.

If the circulation of blood in the lungs be impeded by an increased quantity being determined to them, as we found from our dissections of cholera patients, the evolution of animal heat is thereby proportionally lessened. The same effects take place from paroxysms of asthma, nausea, cold, and soporific medicines.

From analysis of blood of cholera patients, I am satisfied that, in all cases, there is an excess of free carbon in the blood, and hence arise all the phenomena of the disease.

Having examined, chemically, the blood of a diversity of patients in the first stage of epidemic cholera, before the commencement of vomiting and purging, I am satisfied that the first impulse which the system receives is from the terrestrial atmosphere, through the medium of the respiratory system, to which moisture and filthy residences contribute.

I have no doubt this was the case at the breaking out of epidemic cholera in this town, though it was afterwards propagated by contagion in the most direct and convincing manner, particularly from the dead.

From direct experiments, I am assured that this impulse causes, in the first instance, the circulating blood to part with its free carbonic acid by an excited respiratory process. When the blood is in this state, the circulation necessarily becomes languid, for the carbonic acid is to the blood in its circulation what the spiral spring is to the balance wheel of the watch. The free carbon of the blood is gradually restrained in its progress into the air-cells of the lungs, as well as throughout the whole circulation; for at this time not only is the whole circulation retarded, but the surface of the body also is chilled, or collapsed. From this time the animal heat, of course, declines, not half the usual quantity of carbonic acid being formed in the air-cells of the lungs. We even find the patient heavy, melancholic, and listless; the blood, leaving the extremes of the circulatory system, distends the large blood-vessels and viscera, and should the pa-

tient be worn out by poverty, old age, disease, or drunkenness, he may die from excess of carbon in the blood. To use a newly-coined medical phrase, the patient would be poisoned by the black blood entering the coronary arteries of the heart, or the arteries of the brain. Should the patient be rashly raised up, he may die from inanition, as the blood now finds much obstruction in its circulation by reason of its highly inspissated state ; besides, the heart and blood-vessels are, at this time, greatly weakened by the disease.

When epidemic cholera takes its usual course, the blood-vessels of the coats of the stomach are generally influenced by the diseased blood ; sometimes those of the stomach first, sometimes those of the intestines, and often of both at the same time. In some instances I have remarked that such has been the severity of the attack, that blood, as if drawn from a vein, was mixed with the substances ejected by vomiting. The serum of the blood is thrown off from that fluid in both instances, and the salts of the serum not only cause this impulse in the extreme branches of the arteries, but also give those acute pains

and cramps of the inferior, and sometimes of the superior extremities, similar, in many respects, to what we so often observe to arise from looseness or costiveness, through the medium of the nerves of the cellular tissue.

Having, myself, at two different times in the course of last month, been attacked with violent cramps of the bowels and inferior extremities, such as I had never experienced before, I can form some notion of the violence of epidemic cholera. When all the salts, such as are contained in healthy blood, are purged out of the system, the cramps and pains, as a matter of course, leave the body, the patient looks like an animated corpse, and we have, at this time, lymph circulating with the crassamentum as well as serum.

When this pestilence first broke out amongst us, all the medical men of the place considered the disease as not contagious, as we expressed at a meeting at our infirmary, which took place on the 12th of November last ; but not many days afterwards we found, by experience, that epidemic cholera shewed itself to be highly contagious.

Physiology leads us to the conclusion, that every alteration of the solids must be succeeded by an alteration of the blood, just as every modification of blood must be succeeded by a modification of the solids; for, on the one hand, the blood nourishes the solids, and without its presence they cannot support life; so, on the other hand, the solids cannot but be influenced by the state of the blood. Viewed in this light, there is no longer any meaning in the disputes between the solidists and the humorists.

If an individual breathe an atmosphere loaded with deleterious miasmata, or use unwholesome or insufficient food, and become indisposed in consequence, physiology leads us to conclude that, in such cases, the blood has been either the vehicle of morbid matter, or that the vitiated blood has been itself the proximate cause of the disease.

“Le sang est une veritable chair coulante. comme le seve des arbres est une bois encore liquide.”*

* Borden.

When epidemic cholera shews its progress in the system of any individual (and it makes no exception amongst young or old, male or female, whether pregnant or nursing), the animal heat gradually diminishes from the vitiated blood, proving, as evidently as the relation between effect and cause can possibly do, that the lungs are the organs which influence the properties of the blood, and the evolution of animal heat.

The nervous system has no influence whatever upon the generation of animal heat, except in diminishing or retarding those chemical changes on which it depends, by destroying the natural proportions of blood submitted to the action of the air.

From attentive observation, I am satisfied that those parts of Sunderland in which the disease prevailed most extensively were the very places in which typhus fever had formerly prevailed to the greatest extent; and which an experienced medical visitor would fix upon as the most likely for contagious diseases to make their commencement.

I beg to remark that, as far as regards the medical topography of Sunderland, we have

no districts at which particular epidemic or sporadic diseases prevail ; and, with the statement just made, the reader must be satisfied.

It is generally acknowledged that, compared to some other towns, at no great distance, Sunderland may be considered, for a sea-port, as remarkably healthy.

When epidemic cholera appeared at Sunderland, I had no preconceived theory ; and, from all I had read, I was satisfied that the disease had not been investigated in a scientific manner ; that the proximate cause was not known ; that no analysis had been made of the blood, nor of the vomited or purged substances.

I read Hermann's analysis of the blood of cholera patients some time after I had completed my analysis of that and the vomited and purged fluids. In the analysis by Hermann, I could trace nothing but a tissue of errors, by a man who appears to know nothing of physiology, pathology, or animal chemistry.

Having always a most extensive apparatus for the investigation of animal fluids in readiness, I felt no difficulty in prosecuting my

analysis when the epidemic appeared in Sunderland.

In cases in which I had not an opportunity of performing analysis, I made very minute investigations, as far as the senses of sight, taste, and smell permitted, and from these I was impressed that no material changes could thereby be detected in the blood, with the exceptions of what appertained to colour, spissitude, and coagulation.

I often obtained portions of blood of different patients so as to be able to compare, in a suitable manner, the different stages and general progress of the disease. I did not presume further to interfere, as, in several instances, the professional attendants denied that we had any peculiar disease amongst us.

It will readily be observed that an attempt at *ultimate* analysis of blood in typhus fever, epidemic cholera, and other acute diseases, could be of no practical utility in throwing light upon their nature or progress. I therefore devised the plan of taking the blood in vacuo or in water, and, as rapidly as possible, finding out the proportions of the different

substances which enter into the composition of the blood, in a general way, with all the accuracy I possibly could.

From this plan, a general outline was afforded to me in my experiments upon the blood and other fluids, which I earnestly recommend to the attention of professional men, and which I purpose henceforth to pursue.

In describing this, to us, new disease, I am compelled to adopt the inductive plan, being satisfied that I shall thereby be more readily understood.

After making special enquiry into the general state of health of patients, previous to the attack of epidemic cholera, I was informed, by at least one half of my patients, that diarrhœa had been a precursor of the cholera, though there were several who experienced no such attack at any stage of the disease.

In some cases, diarrhœa did not take place previous to the attack ; but in the consecutive fever, it was a severe, and, in some instances, a fatal symptom.

THE FORMATIVE PERIOD.

According to my impressions, the formative period varied from one to five days. My opportunities for observation on this point were very numerous, as I was, from my peculiar situation, a frequent visitor of patients, for whom it was not my province to prescribe.

In those streets of Sunderland in which cholera raged we were often struck with the squalid appearance of the inhabitants in general. Their countenances were sallow, the cheeks hollow, there was generally a dark areola round the eye, and the expression of the countenance shewed dejection and humility. The inhabitants often crowded round the doors of their dwellings when professional men entered their streets: some of these poor people complained of weakness and languor, and some were affected with transient nausea.

FIRST STAGE.

The following symptoms, *before* the attack of vomiting and purging, were the most frequent, viz. universal lassitude, anomalous pains, weakness of the knee joints, so that the patient could scarcely support himself on his

limbs. There was, in some cases, nausea attended with pain at the *scrob. cordis*. Some individuals complained of giddiness, others experienced a sense of fulness in the head and weakened sight. In several cases a creeping numbness pervaded the whole system.

The following case made a powerful impression on my mind, and consider that it may be most suitable to insert it in this place.

Early in the month of November, I was called by Dr. Atkinson, as an act of charity, to visit a respectable female, whose name I have not permission to mention in this work. M. A. T. a married female, aged 32, who had seen better times, had been affected with diarrhoea for two days. Her habits were regular, and to much good sense she had added a good education. She had been married for some years, and, as yet, had no family.

She appeared dejected in spirits, and complained of severe pain in the left leg, which extended to the groin of the same side. Her skin was under the natural degree of heat: her eyesight was impaired, though the eyes did not shew any particular disease: her head was heavy to her feeling, and languor of the whole

system prevailed: her countenance was collapsed: the orbits of the eyes were tinted light brown: the nose and forehead were cold: the pulse was exactly 80, and feeble: tongue loaded, and rather cold to the touch: She was evidently in the first stage of epidemic cholera.

In order to equalise the circulation and also to ascertain the nature of the blood in this stage of the disease sixteen ounces of blood were received in one of my capped flasks from the arm. The blood did not flow remarkably freely, and it coagulated in the usual time. The flask was screwed down the moment the blood was taken, and, before it had time to cool, it was submitted to a most rigid and long-continued process for the extraction of carbonic acid, by means of a very powerful air-pump. No carbonic acid was found in this blood.

I am of opinion that the results of the analysis will be more readily understood by the reader by giving, in a tabular form, the proportions, as presented to me in my analysis of the blood of a sailor, who was bled, at my request, in October last, at our infirmary, for

severe and continued headache, and who, in other respects, had no other symptom of disease.

The sailor's blood contained one cubic inch of free carbonic acid in the sixteen ounces which were taken in one of my capped and graduated flasks.

	The sailor.	The female.
Water	756.....	766
Albumen, dried at 160°	121.....	110
Colouring matter.....	59.....	58
Free carbon	32.....	41
Fibrine, pressed and dried ..	18.....	14
Muriate of soda and of potassa, carb. of soda, and extractive	14.....	11
	<hr/>	<hr/>
	1000	1000

On comparing these results we observe, that the albumen, the colouring matter, the fibrine, and the salts of the blood of the female are less in quantity than those of the sailor, whilst the quantity of free carbon is more abundant in the blood of the latter than that of the

former. Perhaps these differences may in part be accounted for from difference of sex, habit, and strength of system generally; but, from this female undergoing the formative period, we find that the carbonic acid had left the blood, and that the free carbon of the blood was augmented.

Immediate relief was obtained by the blood-letting. The patient was placed in a heated bed with bottles of hot water rolled in flannel, at her feet, and bags of heated sand on each side, from the shoulders downwards. A little white wine negus was given her, and she fell into a profuse perspiration, which was assiduously, by means of heated blankets, kept up for sixteen hours, and from this plan her recovery was rapid, though, for five days, she had the usual consecutive febrile sequela.

The president of our Board of Health, George Robinson, Esq. expressed to me, at the board, great anxiety about an individual for whom he was much interested.

I volunteered a visit, as was usual with me whenever any case of cholera was mentioned at the Board, being the only resident medical member. The patient was a man of

about thirty-five years of age. His skin was hot and moist; pulse 89, and pretty full; the eyes were rather sunk in the orbits; he had nausea, but no vomiting nor purging; the abdomen was not tense nor pained, even upon pressure; he had pains of the limbs, and particularly of the knees; excessive debility and languor; his bowels were regular; his urine was scanty; he had no appetite, but thirst and a dry state of the fauces harassed him. He was a most passive and intelligent patient, and expressed his gratitude for my visit. He was afraid of cholera, and with good reason, as it was very near to him.

I requested his wife to arrange in the manner mentioned above, and by all means in her power, to cause and keep up a copious perspiration; to give no medicine, but to use diluents. This was about eleven A.M.

In the evening, at eight o'clock, I visited the patient, and found that he was, and had been ever since I left him at eleven o'clock, in a most profuse perspiration. He expressed his happiness at his improved state, said he felt nothing of his former complaints. I directed that he should have a total change of body

and bed-linen and blankets, and that he should still be kept warm, but not to such an extent as to cause profuse perspiration.

Next morning, at the Board, the president informed me that the patient was quite recovered.

In the case of the female we may observe how valuable early blood-letting is, when it is performed before either vomiting or purging takes place in this disease. We also observe, from the analysis of the blood, not only the altered nature of that most important fluid, but also feel assured that the disease has its origin from imperfect action in the respiratory system, and not from the nervous system alone, as has been conjectured by many able and experienced medical men.

In the last recorded case we observe the value of free and continued perspiration in epidemic cholera, which may be had recourse to after blood-letting, or when we find the skin in a perspirable state we may safely rely on this very sensible method of cure.

Since these cases were written, I have had most ample opportunities of appreciating both methods, and recommend them, on sound

principles of induction, to the attention of my professional brethren.

In some instances, an emetic, composed of two or three grains of *antimonii tartris*, with twenty or thirty grains of *ipecacuanhæ pulvis*, may be given in this stage, and a tea-spoonful of good mustard powder, mixed in a tumbler of tepid water, may be sipped by desert-spoonfuls every ten or fifteen minutes, so as to settle the stomach. This, in my hands, has proved a most grateful cordial in sick headaches, gouty paroxysms of the stomach, or debility from previous excess in wine or spirits. When an emetic is needful, I would recommend the above plan, or an emetic of *zinci sulphas* as recommended by Dr. James Johnson; but of the latter I have no experience whatever.

I find, in looking over my notes, that, on the 28th of November, the following memorandum was written, and which is at this moment before me.

Inspection of the whole population twice a-day, and instant measures from symptoms, to be adopted. Pure temperate air in winter, and pure air in summer, particularly at night.

By this means the formative period of the disease will be turned to a good account, and all the horrors of the rapid progress of this fatal disease averted.

The reader will pardon the transcription of this very hurried memorandum, which I insert in this manner to prove that, as far as I know, the plan which it details must have been long anterior to any other.

I observed, within these few days (18th Feb. the time of writing), that another physician, Dr. Kirk, is of the same opinion ; but, as he has published on this point before me, I consider him as in possession of the field in this arrangement. Would that others had done likewise by me ! But, of one thing the reader may be assured, that I shall claim all my own, according to dates of publication, as I already see the necessity of such proceeding on my part.

In Mr. Bell's work on cholera, of which a friend lent me a perusal a few days ago, I find some very sensible and pertinent remarks on this disease ; and though, if I remember rightly, they are not supported by any experi-

ments, they are not the less valuable from such practical authority.

The same remarks apply to the works of Orton, Christie, Russell, Barry, and Kennedy.

In recording these cases, I wish to impress upon the reader the great value of perspiration in the first stage of cholera; and, from a multiplicity of similar cases, I am assured that a free and continued perspiration will arrest the progress of the disease, and prevent the frightful vomitings and purgings which have heretofore been seen, or, if I may so express myself, waited for, by the medical practitioner.

I humbly presume to recommend this plan, which, in many instances, will save the necessity of blood-letting.

We have now seen that, in the first stage, the disease may be cured either by blood-letting, or by a continued perspiration.

In so fatal a disease, the method of cure must depend, in a great measure, upon the stage at which we are called in; taking for our basis the nature of the disease, as stated in this work, and holding in remembrance the age, sex, habit, strength, trade or profession.

and even disposition. Some men are wilful, and difficult to manage, and (as in one instance in this town) may sit up, or even stand up, and, in consequence, die instantly from inanition.

I hope it is not too much to remark that, when such a disease is *well ascertained*, the cure is not a difficult task.

I beg to recommend the American heated air apparatus, with three or four flames from spermaceti oil, not from spirit of wine; for, should the flames be large, the bed-clothes may by the latter be set on fire; or, if the apparatus be suddenly removed, or not well attended to, a portion of unburnt carburetted hydrogen may be left amongst the bed-clothes, and, upon returning the flame to its place, the mixed gases may explode: both of which accidents, I am told, by a most respectable medical practitioner, took place in this town.

The *commencement* of the chimney in the heated air bath, which I presented to our infirmary for the use of the patients, is surrounded by a column of water, so that the solder does not run, and the flame is sur-

rounded by a perforated tin apparatus, such as is now in common use in nurseries.

I have also constructed a Mudge's inhaler, the water within which may be kept for any length of time, at any temperature we please.

I have found both these apparatus very serviceable in the cure of epidemic cholera ; and, as this disease, in the rapid type, makes such frightful progress, we cannot be too attentive in arranging our apparatus and practising with them, so as to be completely prepared for emergencies. In my practice, I prefer common pillow-slips filled with heated bran, for giving heat to the body ; and, from the recommendation of one of our experienced men, in cholera cases, I am in the habit of mixing sulphur with the heated bran, which, I think, has some effect in alleviating the cramps before the opiate enema (of which I shall treat presently) be had recourse to.

We are not to expect vomiting and purging in every case, and, by the plan just described, they may be prevented in nine cases out of ten ; besides, I have seen some most severe cases in which neither vomiting, purging, nor blue skin took place.

During the first stage, the patient's mouth and fauces may be kept in a moist state by any agreeable diluent : but, as the stomach, in this disease, is in an excited state, neither drink, food, nor even medicines are to be swallowed, for, as I have proved, the blood being poured into the stomach of the patient, through the excited action of the capillaries of that viscus, no substances, whether fluid or solid, ought be permitted for the use of the patient, but ought to be kept out of his way. Gentle frictions may be employed before the perspiration commences, but it is not indispensable, in this stage, except the patient have cramps or spasms ; which treatment, we all know, has been in use, in this county, for the alleviation of these sympathetic symptoms, long before epidemic cholera was known to Europeans.

In the treatment of our common cholera morbus, I have employed most of the remedies which have heretofore been in use for the cure of epidemic cholera.

I do not pretend to introduce any new medicine from the materia medica, which may appear to carry novelty by the method of

using it. I rest my claims upon the basis of having discovered the exact nature of this new disease, and thereby putting it into the power of competent medical practitioners to arrest its progress, at any of the stages at which he may be called in, by a diversity of remedial measures.

SUMMARY.

If called in at this stage, which I denominate the first collapse, we find that the blood and lymph have left, to a great extent, the surface of the body, and that the centre of the circulatory system is overloaded thereby. In order to empty the stomach and gall bladder, to equalise the circulation, to determine the fluids to the extremities of the circulating branches, and excite diaphoresis, I order the following powder, as the most certain, at the same time most familiar, emetic with which we are acquainted.

R. Ipecac. pulv. scrupulum.

Antimon. tart. grana tria, m. ft. pulvis.

After the operation of the emetic, the patient should be placed in a well-warmed bed; and should he be young, and of a full habit,

blood may be abstracted from the arm, to the amount of 8, 12, or 16 ounces, which will greatly facilitate all curative measures. A diaphoresis should be excited by the heated air apparatus, or by heated substances in bags placed round the body, using frictions over the extremities, by the medium of new flannel, in which operation not less than two or three persons should be employed at the same time. The mouth and fauces to be diligently kept moist by means of any suitable diluent, provided it be not too acidulous. The *juvantia* must be most rigidly attended to, in all the stages of this disease, for, in some instances, cholera commences mildly, and, in a few hours, assumes the rapid type. In such cases, we are sure to lose the patient, if we are not vigilant and prompt in our measures.

A diaphoresis is always to be effected, whether blood-letting be indicated or not.

CONTAGION.

No man can be more sensible of the importance and difficulty of treating upon the subject of contagion than the present writer.

In the month of August, last year, I commenced a series of eudiometrical experiments in the largest room of our infirmary, and though I used every precaution, and employed the eudiometers of Hope, Volta, and Pepys, I could not find any appreciable atmospherical difference with either of these instruments.

I acknowledge, that from the impression that sooner or later we had reason to expect epidemic cholera in this town, I wished to make myself master of the subject of eudiometry, and also, if thought expedient, to try the atmospheres of invaded quarters.

Mr. Penman assisted me in these inquiries.

I am sorry to have to remark, that I was so impressed with the inutility of eudiometrical

experiments, that, though the table was covered with apparatus, when the disease broke out in Sunderland, I did not make one experiment, considering that my time might be better employed in making myself acquainted with the phenomena of the new disease.

If ever eudiometry be useful for investigating the nature of contagious diseases, it must be conducted upon a large scale, or with a large portion of the suspected atmosphere, in a condensed state.

From every inquiry I can make, I find that epidemic cholera, such as we experienced at Sunderland, is, as applies to these kingdoms, a new disease.

The only account which, in description, comes near to this disease, as it appeared before this century in any of the European kingdoms, is to be found in Dr. Trusler's "Habitable World,"—article, "Iceland."

"The number of inhabitants is by no means proportionable to the extent of the country. It was much more populous formerly, but a pestilential disease called the *sorte dod*, or black death, that raged from 1402 to 1404, almost swept away every soul from the island.

This black death, in the year 1402, scarce left a person to relate the dreadful calamity: it has accordingly been omitted in the annals of Iceland, in which nothing else remarkable has been omitted. The few who escaped that great devastation saved themselves by taking refuge in the mountains, and by tradition relate, that the low and flat country was covered with a thick fog during the time of this plague. This disease extended itself to Norway, Sweden, and Denmark, and carried off so many thousands in those countries, that they could not spare people for this colony."

Under the article Iceland, in Rees' Cyclopædia, we have the following.

"In the middle of the 14th century, this island was greatly depopulated by a pestilence called the black death."

Of *contagions*, a great variety have been said to exist; but this seems to be asserted without sufficient evidence. The number of genera and species of contagious diseases, of the class of *pyrexia*, at present known, is not very great. Whether there are any belonging to the order of *phlegmasia*, is doubtful; and though it should be supposed, it will not

much increase the number of contagious pyrexiaë: and as each of the contagious diseases has been found always to retain the same character, and to differ only in circumstances, which may be imputed to season, climate, and other external causes, or to the peculiar constitution of the persons affected, it may thence be concluded, that in each of these species the contagion is of one specific nature; and that there is one principle, perhaps one common, source of such contagions.

It is now well known, that the effluvia arising from the living human body, if long confined in the same place, without being diffused in the atmosphere, acquire a singular virulence; and, in that state, applied to the bodies of men, become the cause of a fever which is very contagious.

Observations on jail and hospital fevers have fully proved the existence of such a cause; and it is sufficiently obvious, that the same virulent matter may be produced in many other places. At the same time, the nature of the fevers arising renders it probable that the virulent state of human effluvia is the common cause of such fevers, as they differ only in a

state of their symptoms, which may be imputed to the circumstances of season, climate, &c. concurring with the contagion, and modifying its force.

With respect to these contagions, though they are spoken of above as a matter floating in the atmosphere, it is proper to observe, that they are never found to act but when they are near to the sources from whence they arise; that is, either near to the bodies of men from whom they immediately issue, or near to some substances which, as having been near to the bodies of men, are imbued with their effluvia, and in which substances these effluvia are sometimes retained in an active state for a very long time. The substances thus imbued with an active matter may be called *fomites*; and it is probable, that contagions, as they arise from fomites, are more powerful than those immediately from the human body. But though it is probable that fevers generally arise from marsh or human effluvia, we cannot with any certainty exclude some other remote causes which are commonly supposed to have a share in producing them. The first of these

causes to be taken notice of is, the operation of cold moisture on the human body.

Drunkards, in most cases, have enlarged livers. In such cases, the *vena portæ hepatica* is frequently compressed by this enlargement, and the current of blood is restrained in quantity after it is duly collected from the stomach, intestines, spleen, and pancreas, by those branches of this important vein, called the *vena portæ abdominalis*.

The death of a drunkard, who might, from intoxication, be exposed to wet or intensely cold weather, and from which his death was effected, cannot, from what is stated above, be classed amongst cholera cases, though he were to become blue-black, as the dyers call it, and though he might have several of the cholera symptoms, asphyxia, vomiting and purging, sunk eyes, thirst, and coldness of the whole system. Such person should be admitted into that class of persons who commit *felo de se*, and not amongst the list of epidemic cholera cases. Such cases are not unfrequent, and heretofore have been classed, very justly, under the designation of apoplexy.

I have hinted above that the commencement of our epidemic, as far as I could trace, had its origin from atmospherical changes, or from terrestrial emanations, or from both. How far I am borne out in this impression, I beg to submit to the reader the following information from persons who could have no theory to serve, nor even an opinion on the subject.

Mr. Gubba, of Memel, informed me this day, 11th February, 1832, that, during the visitation of cholera at that city, the atmosphere was so very heavy that, for three weeks, the rays of the sun did not penetrate the clouds. Many geese and ducks in the neighbourhood of Memel, and also the fish in the vicinity, died from some unknown cause.

The King of Prussia awarded £75 to each of the twelve medical gentlemen of Memel for attendance on the poor during the visitation of that epidemic. Such honourable conduct, as well as the open manner in which that monarch shewed himself amongst his subjects when cholera prevailed at Berlin, commanded the admiration and gratitude of all his subjects.

14th February, 1832.—Peter Clark, aged 19, at present residing at Warren Street, with his father and sister, informed me that he was at Cronstadt Mole on board the Trimdon, Peter Lambton, master, and part owner, when cholera prevailed at that place. There were much thunder and lightning at the time. There frequently fell, during the night time, a quantity of yellow substance, very like sulphur in appearance, which covered the water, the ship, and the clothes which the sailors wore at the time.

He saw, as well as all the sailors, the captain take some of this substance, which fell from the clouds, and place it upon a scrap of paper, and hold it over a candle, when it inflamed with a blue flame, like what we observe when sulphur is submitted to a similar process. It smelt like sulphur before it was submitted to the flame, and also after it was inflamed.

The smell of the air was very sulphurous and offensive. The ship's company were informed by persons from the land, that the same phenomena were observed ashore. They saw at the same time large quantities of cole-

fish laying dead on their sides, and floating round the ship.

William Burleyson, seaman, states, that on the 29th of May, last year, which was the first day of the visitation of cholera, at Riga, there was a thunder storm, followed by a fall of rain, with which sulphur was mixed, as it appeared upon the decks of the ships; and that, on the water in the bottom of the long-boat, lying astern of the vessel in which he sailed, a yellow scum floated.

I have this day, 15th February, 1832, seen Captain Thomas Lamb, who was on board the *Eliza* and *Margaret* at Riga when epidemic cholera broke out at that port, at which time there occurred a severe thunder storm. During the night and the following morning, the decks were covered with a powder or dust like sulphur. The captain informs me that such a fall was never heard of before in the Baltic.

None of the superior classes of society in Bishopwearmouth underwent the disease; and as the 82d regiment were kept close within barracks during the whole time of the prevalence of the epidemic cholera, which raged

in the immediate vicinity of the barracks, neither the officers nor their families, nor the soldiers nor their families, were afflicted with the disease

It is a remarkable fact, as recorded by Dr. Turnbull Christie, that the cholera preserves exactly the same characters in Arabia and Egypt that it has exhibited in all other countries. It continues only for a limited time in one place, where it gradually increases in intensity, at length diminishes, ceases, and then bursts forth in another spot which had hitherto been free from it, runs the same course there, and passes on to some other place, where exactly the same thing is repeated.

In a history of the County of Durham, which is at this time published, in parts, by Mr. Mackenzie, we find the following paragraphs at page 266 of that work :—" In the year 1665, during the plague of London, that dreadful disease was imported to Sunderland by shipping, as appears from the following entry taken from the Register Book of the parish of Bishopwearmouth :—' Jeremy Read, Billingham, in Kent, bringer of the plague, of

which died about thirty persons out of Sunderland in three months. Sepult. July 5th. 1665.’”

I think this extract is at this moment very interesting, at the same time I do not at all infer in transcribing the above, that the epidemic cholera was imported into Sunderland, on the contrary, after the most careful and persevering research on this point, I am compelled to acknowledge that, according to my experience, the disease was not imported from the continent, agreeable to our present impressions as to the formative period of the disease.

Mr. Lord, parish clerk of the parish of Sunderland, furnished me with the following lists.

Mortality in the parish of Sunderland :—

In 1829	521 deaths,
1830	479 do.
1831	749 do.

He mentions that he extracted the mortality of 1829 to shew that there was a decrease of 42 in 1830. He states that scarlatina was prevalent in 1830. It appears, by the register,

that, out of the 479 deaths which took place in the year 1830, 263 were under ten years of age. Typhus did not prevail that year to any particular extent. By the kindness of Mr. Lord, I am also furnished with the number of burials which took place in the parish of Sunderland from October 1831 to 3d January, 1832, about which time epidemic cholera had nearly been extinguished in the town of Sunderland and vicinity. Cholera 155; typhus 1; other diseases 103; total 259.

SECOND STAGE.

This stage is marked by excessive vomiting and purging; at first shewing the usual contents of the stomach, and afterwards exhibiting the rice water, or flour and water appearance. The same remarks apply to the purging; and the quantities of vomited and purged fluids are generally excessive, beyond all preconceived idea.

When the vomiting is severe, I have often remarked that blood was mixed with the vomited fluid. In such cases, there was violent heat at the stomach and in the fauces, and the patient's thirst was excessive. At this

period, I often witnessed cramps and spasms of the arms and fingers; and we generally found, on our first arrival, that the patients were either occupied with vomiting, purging, or drinking.

The purging generally came on after the vomiting had commenced, but frequently the contrary obtained, and they sometimes alternated. Such was the severity of the purging, that the patients could not restrain a single minute, and the dejections were often projected, as if from a powerful gardener's syringe. The fluids from the bowels were sometimes clear throughout; sometimes as if a tablespoonful of finely powdered rice, or of fine flour, had been mixed with clear water; and sometimes this flocculent substance appeared like animal-extractive, after it had been submitted to the 212th degree.

The cramps and spasms of the inferior extremities were, at this period, as far as my observation warrant, the most intense and incessant.

The jactitation shewed the severity of the disease, and the thirst was intolerable. The patient generally displayed sufficient energy

when he had to raise himself up. The pulse was small and frequent; in some cases, as high as 120, in others, as low as 60. The face was often cold to the touch, and the forehead bedewed with a cold perspiration.

The heat of the skin at this time was generally below the natural standard, and a blueness was often seen in the countenance. The mind is seldom clouded, even after the most severe pains, whether from spasms or cramps. It is at this stage that the symptoms of epidemic cholera commence to develop themselves in the most marked manner. The discharge of urine, in every case which I attended, ceased at or before this stage, and the patient appeared weak, languid, and attenuated.

Early in the month of November I was called to visit J. G. of the parish of Sunderland. She was in her fortieth year, and married. She appeared delicate in person, and the tarsi were in a state of passive inflammation.

I observed that a dun areola surrounded her eyes. She informed me that for eight hours she had been harrassed with almost

incessant vomiting and purging. Diarrhoea was not a precursor in this case.

A medical gentleman had been called in, who told her that she was attacked with typhus fever, and it was needful to take blood from the arm, which was done accordingly, to the extent of fourteen ounces, about half an hour before I arrived.

The patient complained of thirst and pain in the abdomen. She had severe cramps of the inferior extremities; the fingers were clenched and blue, as also the toes. There was a slight blue tint over the whole body. The pulse was 85, weak, and in a slight degree irregular. The hand indicated the 85th degree. The tongue was clean, soft to the touch, and rather cold. She informed me that the vomited fluids were at first dark, and mixed with indigested food. Afterwards they appeared fluid throughout, and were acid to the taste. About two hours before I saw her, they were very thin, and tinted with blood.

The motions were at first dark and fetid. They gradually became lighter in colour, were thrown off with intense vehemence, and were by no means bilious or opaque, but thin, and

the upper portion diaphanous. She lay very quiet and passive, was very weak, but not desponding.

When the pain was severe, she had cold perspirations, particularly over the bust. Her nose was cold and pinched. The fingers were corrugated as if from washing linen. In short, it was a well-marked case of epidemic cholera. I saw the delicacy of my position; and, as this person (being a pauper) was told that she was labouring under typhus, I considered it my duty to do all I could for her in her distressing situation. She was, without delay, cased in bags of heated bran. Frietions over the extremities were used most diligently; and, when this remedial process was intermitted, bottles of warm water rolled in flannel were applied to the feet and hands.

I wished to avoid giving offence to any person; at the same time, I was impelled by an ardent desire to ascertain the nature of epidemic cholera in the face of every obstacle.

It is well known that more than half of our medical practitioners denied that any new disease had broken out in Sunderland.

For a length of time, our new epidemic was called simple diarrhœa, common cholera, congestive fever, typhus, &c.

The blood was very dark, and not unlike treacle in its general appearance. I submitted it to the process for extracting carbonic acid, by means of the exhausted receiver of a powerful air-pump; and, though I bestowed much care and perseverance in the process, I could not obtain the smallest portion of that or any other gas from this blood.

I afterwards analysed this blood, and the following were the results.

Water	720
Albumen, dried at 160°	61
Colouring matter	161
Free carbon	49
Fibrine, pressed and dried in the atmosphere	6
Muriate of soda, carbonate of soda, and animal extractive	3
	<hr/> 1000

I submitted the vomited fluid to the exhausted receiver of the air-pump, but could not procure any gas of any description.

I analysed this vomited fluid with much care in the manner I adopted for the analysis of blood of typhus patients, as published in the *Edinburgh Medical and Surgical Journal* in the year 1829, and the following were the results.

Water	991
Fibrine	5
Albumen	1
Carbonate of soda	2
Animal extractive	1
	<hr/>
	1000

The following results were obtained by analysis of the dejected fluid.

Water	989
Fibrine	6
Carbonate of soda	3
Animal extractive	2
	<hr/>
	1000

This fluid contained no gas.

I need not tire the reader by giving additional tables of the chemical nature of vomited and purged fluids. Suffice it to say that the similarity was very remarkable in a diversity of cases.

From these results we are compelled to infer, that the serum of the blood has been in this case percolated through the capillaries of the stomach and intestines, that there is nothing of a poisonous nature in these substances, and that the excess of free carbon is the sole cause of all the mischief which takes place in epidemic cholera.

We must now return to the detail of this patient's case.

The powers of life were greatly exhausted, and, as every thing was rejected from the stomach, I was induced to use the following simple enema, holding in remembrance the results of my investigations.

R. Opii. pulv. gr. vi.

Aquæ puræ uncias xii.

Solve fiant enema.

Injicitur calidum.

This was firmly retained within the body by means of a wadded T bandage.

At my next visit, which was two hours afterwards, I found that the anodyne enema was still retained, the thirst was not so urgent, there was no disposition to vomit, and the patient was quiet and tranquil.

Two hours afterwards I found, on visiting the patient, that the enema had been returned. I ordered it to be renewed, and all the urgent symptoms to be suitably attended to. Five hours afterwards, I found that the patient had continued tranquil since my last visit, and had slept about half an hour, from which she found much relief.

I now ordered a pint of a strong infusion of the lean part of mutton to be injected, with directions to secure the bandage, so that no part of it might be lost from neglect or inattention. I directed that if the bandage were not sufficient a tapering cork, well oiled, should be placed within the sphincter and after a fresh injection had been thrown up.

I felt much anxiety now that I had adopted a new plan by which the enemata were to be retained by force, though I knew that there was nothing fearful in the blood or the vomited and purged fluids.

At my next visit, eight hours afterwards, I found my patient much relieved in every respect: the enema had been retained by the cork. up to this hour; some urine had been

passed, and she had partaken of some sago in which a small portion of brandy had been mixed. Fresh bile was now observed in the returned enema. The heat on the surface was increased, and every untoward symptom alleviated.

Her recovery was now ensured, and the sequela of the disease lasted only two days.

I had the kind assistance of Dr. Atkinson in my investigation of this case, and avail myself of this opportunity to thank him for his services.

SUMMARY.

The patients, in some severe cases of epidemic cholera, both when asleep and awake, turn up the eyes till nothing but the white part of the eye becomes visible.

In some cases, after vomiting and purging have ceased, small doses of calomel, guarded by suitable doses of opium, cut short the consecutive sequela, whilst the secretions, particularly of the liver, were by this means restored. The blue pill answers a good purpose, when administered under such circumstances.

We know that, after severe vomiting and purging, the urine must cease to be secreted, from the frightful deficiency of the water of the blood.

James Elliott, one of Mr. Embleton's cholera patients, passed no urine for ten days. Had urea been circulated in the blood of this patient he could not have survived such an event for half the above-mentioned time.

The first account of the use of enemata, whether anodyne, diluting, or nutritious, which appears in any of our publications on the subject of cholera, since its appearance in this town, is to be found in the *Lancet* for the 4th of February last, which was communicated by the present writer; and, from the case just recorded, it will be observed that, early in November, I employed this plan of treatment, which was four or five weeks previous to any other that came to my knowledge.

Whilst the vomiting and purging continue, it is worse than useless to give the patient either medicine or food to swallow, as I have too often experienced before I became acquainted with the nature of this disease.

Reflecting upon the excessive vomiting which we observe in cases of obstruction of the pylorus, from scirrhus or other disease of the stomach, I have often wondered where such quantities of fluid came from, and it is only now that I can account for it satisfactorily, as I have no doubt but the capillaries of the stomach throw off the serum of the blood in this manner in the above-mentioned disease.

In scirrhus of the pylorus the patient always complains of heat at the *scrob. cordis*, which is to him a warning symptom that the vomiting is about to commence. Apply this to the phenomena of heat and pain of the fauces, gullet, and stomach of patients affected with hydrophobia—remember the continued and excessive secretion of saliva in such cases. Let us also recollect the excessive quantity of fluid thrown out of the intestines in cases of hypercatharsis, which in some cases shews a similitude to the dejections of cases of epidemic cholera. These hints are thrown out for the exercise of minds or hands of scientific men of our profession.

At all times, neutral salts are to be avoided most carefully, as, from my own knowledge, one patient was nearly destroyed by taking a dose of epsom salts in the sequela of the disease.

SUMMARY.

I feel much confidence in recommending the remedial plug, as stated in the case of J. G. ; and from analogy, we are warranted, by ample experience, of the value of the tourniquet, for the purpose of restraining hemorrhage of blood, in cases of severe wounds or accidents. The good effects of Rigby's plug in uterine hemorrhage, from whatever cause, is too well appreciated by all experienced medical practitioners, to require a remark from me.

I see no reason why we should not restrain the draining of the serum of the blood from the system, by using a plug in the manner pointed out above ; and if success be a criterion of the value of any new remedial plan, I am warranted, from principle to recommend this method of cure to my professional brethren. I shall now proceed to the

THIRD STAGE, OR SECOND COLLAPSE.

After the cessation of vomiting and purging, the centre of the sanguineous system is more or less loaded with thick black blood, and in severe cases, the arterial system is charged with black blood.

At this stage the cramps and spasms cease, as the capillaries are no longer stimulated by the passage of the serum, with its salts, through them. The excretions and secretions are at an end. The system is completely chilled, and in many instances, the thermometer, when placed under the tongue, shewed the 26th degree, and the heat of the hand shewed the 20th degree. The eyes are sunk in their orbits. The sight is impaired. The heart beats very feebly. The pulse beats from 14 to 25 beats per minute. In many instances no pulsation can be felt at the radial artery. The voice is lost. The expired air feels cold to the hand, and the tongue gives the sensation of a piece of raw flesh to the touch. The limbs are sometimes permanently contracted, and the facies hippocratica is observed.

The patient is quiet, and appears to retire within himself. He answers all questions put to him. His breathing is remarkably feeble and short. The whole appearance shews a complete collapse. The skin is generally blue, particularly upon the face, hands, and feet. He shews the whites of the eyes frequently in his conversation, which symptom is permanent when he is asleep. Youthful persons assume the appearance of extreme old age.

Heat and frictions, as directed in the previous stage, should be had recourse to in this stage, with increased assiduity. After due inquiry and reflection, a few ounces of blood may be taken from the arm, for the express purpose of attenuating the blood, and drawing the lymph of the system into the general circulation. By blood-letting, the functions of the capillaries will, in a general way, be restored, and the blood will circulate in a more correct and healthy manner. The mouth should be kept moist with any bland fluid.

In such cases I employ a deep cylindrical tin vessel, which holds the arm nearly to the armpit: I fill this vessel to a certain height

with clear water, at the 98th degree, and, having measured the water by a scale, I allow the blood to flow into the water, and from time to time measure the quantity till, from the symptoms, and particularly from the state of the pulse, I have removed as much of that fluid as I think needful. In this manner, I find no difficulty in drawing blood from cholera patients. I do not consider it very safe to remove blood from the system when debility prevails, and, as a more rational and efficient remedy, by means of suitable enema, may now be freely practised, I think it necessary to caution medical men more than ever in using blood-letting in the second or third stage of the disease.

I am free to acknowledge that I never witnessed any good effects from the use of blisters, sinapisms, or scalding water, in this stage of the disease ; nor has calomel, ammonia, or any preparation of opium, been of the least use in this stage of the disease.

From the observations of Dr. Slade Knight, as lately recorded in the pages of the *Lancet*, and also from the viva voce reports of Mr. Torbock, Surgeon. I am inclined to think

very favourably of half-drachm and drachm doses of carbonate of soda in this frightful stage of the disease ; and, should opportunities offer, I would certainly employ this medicine, more particularly as its use is founded on sound pathological doctrine.

As stated above, we find in this stage that the patient has vomited and been purged till, in a direct manner, the serum of the blood is almost all expended.

By means of an apparatus, or of a proper syringe, large quantities of infusion of mutton or veal may be given, by way of enema, and retained by means of a cushioned T bandage, or of a tapering well-oiled cork, as mentioned above. From this the patient will feel instant relief, and all the symptoms will be instantly alleviated. Should a desire to get quit of this injection distress the patient, it may be allowed to be returned, in fifteen or thirty minutes. By this means a pint or two of such fluid may be kept constantly in the large intestines. In some cases, it may perhaps be needful to add to the enema a few drops of tincture or powder of opium. In most instances, I have observed the returned enema was tinted more

or less with new bile, and in a short time the bile appeared to increase with every fresh enema ; and this was in every instance a progressive symptom.

About this time, the kidneys secrete urine, and the bladder readily expels it, at first in small quantities, and soon afterwards in abundance, in which, upon trial, I found the usual salts, but no increase of urea. The symptoms are to be closely and assiduously attended to, and every effort should be made to promote the circulation of the blood in the extreme branches of the circulatory system. The patient should be kept comfortable in every respect, and his mind undisturbed.

The attendants should never leave the patient for a moment, for, should he sit up, he might die from the weakened state of the heart and arteries—from venal blood circulating in the arterial system—or, from the thick and vitiated blood being too heavy for the arteries to carry to the head in the patient's altered position.

Should the patient at this time desire nourishment he may be indulged with small portions of tapioca or sago much diluted, to

which a little good brandy or sherry may be added.

I have always found that at this time all peculiar symptoms of epidemic cholera leave the patient. Topical affections, or increased determinations to certain parts of the body, may require cupping, leeching, or blistering, as remedial measures; and, from my experience, all medicines are worse than useless whilst the patient has any uneasiness of the *serob. cordis*, or any disposition to vomit either his food or medicine.

Should the liver or kidneys be slow in performing their duty, from ten to twenty grains of blue pill may be given every hour or every two hours till these secretions recommence.

In general, I have found this plan to effect what I desired; but if the blue pill be too slow in its action, *hydrarg. cum creta* may be had recourse to, or calomel with opium, according to the ideas or views of the medical attendant.

In this stage I have often ordered *ol. terebinth.* to be mixed with the infusion or soup *enemata*. Effervescing draughts have been very useful in my practice.

From my experiments, we are assured that, in the third stage or second collapse, the blood is deprived of its serum, and that the lymph of the system is taken into the mass of blood. In my opinion, transfusion cannot be attempted, because the cholera patient at this stage requires no additional crassamentum ; but, from the above analysis, we find that, could we supply *serum*, we might do some good ; but how to acquire a sufficient portion of serum becomes a most serious question.

It was my intention to prepare artificial serum, and, by Dr. Blundell's improved garded funnel, allow a sufficient supply to be given to the system ; and, in order to keep the fluid at a proper temperature, I have added a hot water holder to the outer surface of the funnel, by which I can keep blood, serum, or artificial serum, at the temperature of blood-heat.

I presented this apparatus to our general infirmary.

It is astonishing how rapidly some patients recover from this frightful collapse ; and it is difficult to give an explanation of the phenomena. Take the following for want of a better explanation.

We have all seen persons in articulo mortis, from obstruction of a gallstone in the ductus communis, or a calculus in the ureter : and, when we expect instant death, we find that these obstructions are, under our observation, removed, perhaps by the shock of universal relaxation which the system feels at the moment.

Something of this sort certainly obtained in some cases of cholera, when the frightful collapse threatened instant death.

When reaction takes place, as I have several times observed in young persons, with the blue tinge of the countenance, a slight blush of scarlet was commixed, which rendered the face a crimson lilac : this is favourable. The heat is augmented, and the heart and arteries beat more firmly and more frequently ; which, in time, gives action to the arterial branches. The patient wishes to change his position even before his strength enables him so to do.

Whilst we endeavour to obviate debility in this stage, we are called upon to attend closely to particular determinations of the blood, and to obviate them by every means in our power. If the kidneys do not perform their duty, we

must use diuretics and demulcents, and the peristaltic motion should be kept in full play, for which warm aperients may, in favourable cases, be administered. If much debility prevail, the regimen and diet ought to be closely attended to.

We must hold in remembrance that the antiphlogistic regimen is indispensable to prevent inflammatory attacks, which, in the sequela of cholera, are so highly dangerous.

The food should be in a liquid form, and prepared from vegetables in preference to animal substances, and should be given in small quantities, and repeated at short intervals, during the day time only.

THE FOURTH STAGE, OR SEQUELA, SOMETIMES CALLED CONSECUTIVE FEVER.

From what has been stated above, the reader will readily understand, that after the system has received the shock of this disease he will feel exhausted and debilitated.

These symptoms could soon be removed, did not the sanguineous system labour under an oppressed load of free carbon.

In this stage, the blood is found to resemble that of typhus fever, in its last stage, in all its distinctive qualities, as may be readily understood on reference to my work on that disease.

Should the patient be of a healthy constitution, and should he be free from organic diseases, particularly of the lungs and liver, the chances that this excess of carbon may be gradually worked out of the system are in his favour, and vice versa.

I find that the plan recommended in that work answers a good purpose in the sequela of epidemic cholera, viz. frequent use of effervescing draughts, minute attention to the secretions and excretions, nourishing enemata, obviating determinations to important organs, particularly to the brain, spinal marrow, liver, stomach, and intestines. The frequent ochry dejections shew that the liver is at fault, and mucous sanguineous discharges the stomach and intestines.

Mild aperients, such as infusion of senna, or oleum ricini, answer a good purpose for keeping the bowels in a proper state, to which different mild preparations of quicksilver,

when the liver is at fault, may be conjoined. The same may be used, should the kidneys be slow in their action of secretion; and if needful, diuretics, of a suitable nature, may be added.

Gentle and continued frictions, over the whole system, are very serviceable in this stage.

The system, in the sequela is, in my opinion, improved by the suitable use of different preparations of quicksilver; nor have I ever experienced any bad effects from their use, either in this or in any other stage of the disease; at the same time I must remark, that I always prescribed them with much caution and circumspection. I rely upon enemata of infusions of mutton, veal, or chicken, for affording nourishment to patients, in the sequela of epidemic cholera; and under this plan the stomach is not called upon, in its weakened state, to perform the important office of digestion. I cannot recommend preparations of opium, or the ingurgitation of wine, or of spirits, in this stage of the disease. All appearances of determination are to be watched with the greatest care and assiduity.

I sometimes ordered the hair of the head to be cut off, and, in some instances, the head to be shaved, in order that cooling applications might have a full effect. Blisters, to the crown of the head, answer a better purpose than at the nape of the neck, besides they are more readily retained on the head. A blister may be applied to the scrob. cordis. Mustard poultices to the feet and legs were serviceable. I have never used the sulphat of quinine in any stage of cholera, as I never observed any appearance of intermittent type to supervene. Warm aperients, such as extract of colocynth, scammony, or aloes, under different forms, are most suitable, when, with a slow state of the bowels, symptoms of dyspepsia take place.

The patient should be encouraged, so as to keep his mind tranquil; the air should be pure and dry; the bed and body linen clean; and the state of the mouth attended to.

RAPID TYPE.

In the severe form, or rapid type, of epidemic cholera, as the disease runs through its stages in a few hours. all the energies

and talents of the medical attendant are imperviously called for.

The professional attendant should not leave his patient for more than fifteen minutes, for, should he fly to cold water, or get out of bed, or even sit up in bed, in the last hours of the disease, his life would be endangered.

This form of the disease shews that there is an excess of carbon in the blood, from the very first; and frequently the patient becomes helpless as a child, and, as it was termed in our town, was "felled" from the first attack of the disease. The pulse flags, and frequently ceases at the radial artery; the animal heat falls to the lowest grade consistent with animation.

In a word, this form of the disease requires all the discrimination and ready talents which we can muster to arrest its progress.

This form of the disease has, not unaptly, been called cholera asphyxia.

In my opinion, blood-letting should be had recourse to as soon as possible. The quantity of blood to be taken should be regulated according to circumstances. Heat, frictions, anodyne enemata, to which *oleum terebinthinæ*

may, if needful, be added, should be diligently employed.

Should the second stage have arrived, accompanied by great prostration of strength, we must use venesection with great moderation and caution.

Sometimes the disease wracks its powers upon the system before the vomiting and purging commence, these symptoms become the last instead of the first.

As the sanguineous system is surcharged with free carbon, pure air, dry heat, frictions, and enemata, as above mentioned, should be diligently attended to, and the different forms should be met by suitable remedial processes, as detailed at length in the preceding pages of this volume.

In many cases, preparations of opium, diffusible stimuli, and venesection, appeared to me, in my official situation as examiner of cases, to do more harm than good ; and I assert, that, at the first ingress of the disease, this fact was strongly impressed upon my mind.

I have seen cajeput oil and other stimuli of this class used in this form without the small-

est relief being afforded to the patient. I am satisfied that all medicines by the mouth in this type of the disease should be administered with much caution.

The mouth and gullet may be kept in a moistened state by an infusion of ginger, and effervescing draughts are peculiarly indicated in the rapid form of cholera. Compare this form of the disease with apoplexy, from blood charged with excess of free carbon, and we shall find that most of the symptoms of these diseases bear a strong resemblance in all their leading characteristics. The same remedial measures are indicated in both diseases. In rapid cholera we frequently find that no warning is given and the affected person falls down, from the black blood extinguishing vitality, whether it enter the brain or the coronary arteries of the heart.

In this town, particularly in the month of November, this form of the disease was most awfully rapid and fatal, often running its course in ten or fifteen hours.

The following case exhibits this form of the disease.

“Elliot Todd, aged 33, living at No 22, Warren-street, in which house three persons had died of cholera morbus—but with whom he had no connexion, being too much afraid to go near them*—of very intemperate habits, had been poorly for a week.

Was attacked December 12th, at two o'clock A.M. Complained of pain in his bowels and cramps in his feet.

At seven A.M. the purging commenced. Was seen by Dr. Law, of Dublin.

At nine A.M. ordered Calomelan, opii, capsi, aa. gr. ij secunda quaque bora The first dose produced vomiting, for the first time, of a slate-coloured mucus. Purging still continued, being a rice-like fluid. The spasms of the lower extremities continued; pulse not to be felt at the wrist.

Venesection to the extent of seven and a half ounces. The pulse could now be found at the wrist. Gave him a dose of sulph. ether and opium. Livid appearance left his hands, and he seemed easier.

At three P.M. the extremities became cold, no urine secreted; pulse not to be felt at the

* The house is divided into tenements.

wrist ; no longer any cramps ; gave him some brandy.

He died at seven p.m. of the same day. After death the face appeared natural ; the skin of the hands was corrugated ; the nails were livid, and the fingers and toes contracted.

(Signed) T. H. EMBLETON."

REMARKS.

I did not attend this case, but the blood was given to me for analysis the same day. This may be called a case of severe or rapid type, or *la cholera foudroyante* of the French ; and amongst a multiplicity of cases this was the most suitable for information as to the nature of the blood.

This blood, on applying the tongue to it, had no taste, nor any particular smell ; I also tasted it again, some time after it had been drawn. I afterwards tasted the colouring matter, the coagulated albumen, and the fibrine, but in them I found neither taste nor smell. It contained no gas of any description, and was as black as tar. I followed the plan, which I have taken the liberty of recom-

mending to my professional brethren, in the investigation of typhus and other diseases, and which I intend henceforth, for many reasons, to pursue.

Water,	644
Albumen, dried at 160°,	31
Colouring matter,	253
Free carbon,	66
Fibrine, pressed and dried,	6
Muriate of soda, &c.	0
	<hr/>
	1000

I think it will be readily understood that as I did not see this case, it will be out of my power to make any comment upon it. The results of the analysis are most instructive, and by the medical philosopher must be regarded with astonishment. The blood in this case possesses only two ounces of serum, which appeared like serum of healthy blood.

Attacks of this description generally commenced soon after midnight; and it too often occurred, that the patient was past recovery

long before the arrival of the medical practitioner.

On examining, with proper glasses, the skin of cholera patients, which became blue from the disease, I found that this tint was occasioned by the black blood ceasing to circulate, and becoming stagnant in the extreme branches of the blood-vessels of the integuments.

Some cases, instead of blue, shewed an isabella or dun colour, which was occasioned by branches of blood-vessels and lymphatics being completely divested of their proper fluids.

We often observe, that persons recently recovered from severe or emaciating diseases acquire this tint of the complexion, which, as regards females, is by no means a symptom of chlorosis, as some medical men have supposed.

After the investigation of the blood of Elliot Todd, nothing can induce me to believe that the salts contained in blood contribute, in the smallest degree, to the forces employed in the process of circulation.

When the crassamentum is formed, the free carbon appears to be intimately commixed with the colouring matter. We know that they are not in chemical union by reason of the

rapidity with which the blood becomes altered in colour, from changes in the process of respiration. Colouring matter, according to Berzelius, when incinerated, affords a residue of

Oxide of iron,	50.	0
Sabphosphate of iron	7.	5
Phosphate of lime with magnesia	6.	0
Lime,	20.	0
Carbonic acid and loss,	16.	5
	<hr/>	
	100.	0

Several professional gentlemen of the highest celebrity, foreigners as well as natives, of these islands, witnessed my experiments on the fluids of cholera patients; indeed I considered it a duty as well as a pleasure to entertain such visitors.

After much reflection upon the subject of free carbon, I devised and carried into effect the following method for discovering its proportion in the blood of different individuals; and if a multiplicity of experiments, which uniformly accorded not only with sound pa-

thology but also with each other in their results, be considered as deserving the confidence of the profession, I feel satisfied that this plan of investigation will be found not only worthy their approbation, but also suitably convenient to such practitioners as may not be in the habit of performing chemical experiments.

Having carefully collected the colouring matter, in the manner which I formerly published, and having dried and powdered it, I place it in a crucible, to which is closely fitted a cover out of the centre of which issues a small tube with a stop-cock. This apparatus is made of platinum, and is perfectly air-tight.

Having a charcoal fire in the furnace in readiness, I fill the crucible with the powdered colouring matter, after which I remove it to the scale to weigh it. When it is returned to the crucible, leaving the stop-cock open, I gradually heat the crucible till the gases are extricated: I now shut the stop-cock, continue the process till the crucible arrive at a white heat, and keep it in that state for the space of a few minutes: I now remove the apparatus from the fire, and find in the cruci-

ble, when cold, pure carbon and a bulky cinder. I wash, dry, and weigh the carbon.

I weigh the cinder, break it into fragments, submit it again to a white heat, and afterwards collect the carbon, if any, and add it to the above-mentioned quantity.

In this way I meet with no difficulty in ascertaining the nature of blood, as to its free carbon, whether the patient be affected with epidemic cholera, or any other disease.

I find, from experience, that by this process I am enabled, *cæteris paribus*, to discover the nature of epidemic cholera, not only as to the stage at which the blood is taken, but also as regards the progress and intensity of the disease. The same observations apply, in a certain degree, to the vomited and dejected fluids.

The magnet does not influence this carbon. I find it very black, inodorous, insipid, insoluble in water, and readily combustible in oxygen gas.

I know of no other method by which we can arrive at an accurate knowledge of the exact proportion of carbon in the blood, nor

do I believe that any other more suitable can be devised.

We must hold in remembrance that it is only by ascertaining the *relative proportions* of carbonic acid, of water, of albumen, of colouring matter, of free carbon, of fibrine, and of the salts of the blood, that we shall be enabled to arrive at a correct knowledge of the nature of typhus, epidemic cholera, and such-like diseases.

I added to the platinum tube a bent brass tube, and in a quiksilver pneumatic apparatus collected the gas from the colouring matter of the blood as it arose. Upon analysis I found that this gas was composed of carburetted hydrogen three parts, and of carbonic acid one part.

Though my chemical investigations of this disease have, at least, the priority of any others in this kingdom, still I cannot resist expressing the satisfaction I experienced in observing, in the *Lancet*, that I am corroborated by such authorities as Professor Delpech and Dr. O'Shaughnessy.

The Professor and his friends, Doctors Lowenhagn and Coste, visited me on the 3d of

February, to whom I gave every information in my power as to the origin of the disease in this town, and also the method I employed in my investigations of the blood and vomited and purged fluids of cholera cases, to which the Professor alludes ; vide *Lancet* for 3d of March ; and also in a letter, addressed to me from Edinburgh, dated 22d February, an extract from which I shall take the liberty of placing before the reader.

“ Monsieur et très honorable confrère,

“ J' éprouve le besoin de vous redire tout ce que je ressens de gratitude pour les services que nous vous devons dans l' étude du choléra ; et d' affection, et d' estime, pour les qualités et les lumières que vous avez montrées dans les instans, trop rapidement écoulés, que j' ai eu le bonheur de passer auprès de vous. Tout ce que j' ai vu depuis en Ecosse, et surtout à Glasgow, m' a fait vivement sentir l' importance de vos études, qu' il est bien à désirer que vous preniez la pienne de continuer. La maladie se répand partout et partout, et elle montre une fureur terrible,” &c.

The same gentleman, in a letter to Professor Lizars, of Edinburgh, after giving interesting details of dissections of several im-

portant cases of cholera, dated 22d February (same date as above), concludes in the following words, which I transcribe from the Cholera Gazette, No. 4, for 3d March, 1832.

“Already the investigating spirit of your estimable fellow-countrymen has been directed towards the alteration of the blood, and the chemical nature of the dejections, and they have established the fact, that all that is deficient in the former is found to exist in the latter.”

From every dissection of epidemic cholera which I have witnessed, as well as the evidence of written accounts, I am satisfied that the restrained state of the circulation of the blood, and its consequent state of vitiation, as explained in a former part of this work, contribute to the enlargement of the blood-vessels of the lungs, the liver, the stomach, the intestines, and brain, and, generally speaking, the centre of the circulatory system, whilst the extreme branches thereof are deprived of their usual quantity of fluids, with the notable exception of the capillaries of the

stomach and intestines, at the second stage of the disease.

In some cases, this excess of free carbon causes universal torpor of the nervous system, in which the stomach and intestines so largely participate that neither vomiting nor purging take place, and the patient dies from asphyxia.

During and after the vomiting and purging stage, we have remarked, on dissection, that the *venæ portæ* are empty ; hence, in a special manner, we never find that bile is secreted, till a new action take place, and the patient is on the road to recovery.

On using enemata, I find that after they have been forcibly retained in the intestines for some time, they always shew a tint of fresh bile, when they are returned into the atmosphere. Venesection is always more readily and more effectually performed after the enemata have warmed and quieted the system : the same remark is applicable to the excitement of perspiration.

In conclusion, I beg to remark that a perfect knowledge of the disease in all its stages, as inculcated in this treatise, will enable com-

petent medical practitioners to anticipate those rapid changes which too often hurry cholera patients out of the world.

At pages 87 and 88 the reader will remark, that early in the course of our visitation I was impressed with the necessity of medical inspections of the whole population of infected districts, at least twice in twenty-four hours. From actual observation, I beg to urge the attention of the authorities to this plan; and, as stated above, I have, in the formative period, been enabled, by the use of enemata, diaphoretics, and venesection, to effect all I desired in arresting the progress of this frightful disease.

Boards of Health ought to be formed in every district, some time before the arrival of the disease; and if I am not prejudiced in favour of our precautionary arrangements in this town, I hesitate not to say, that except in the article of money, we were thoroughly prepared for the worst, some weeks before our visitation.

We met the shock with manly firmness; and though, from unavoidable causes, our success was not what it ought to have been,

it will be found that it was at least on a par with what took place, and is at present taking place in other parts of Great Britain.

How far I have deserved the calumnies which, in certain quarters, have been so lavishly heaped upon me, an enlightened and liberal community will now be enabled to judge.

P. S.—It seems inherent to this disease, perhaps from its novelty and intensity, that, generally speaking, medical men who have heretofore written upon this subject, have been more desirous of displaying their graphic and argumentative talents, than applying their time and scientific attainments for its investigation.

We have an example of this in the article "Cholera," in the fourth part of a useful periodical, now publishing in parts, entitled "Cyclopædia of Practical Medicine," dated April, 1832. At page 398 the following words wind up a prolonged paragraph:—

"But there are diseases, and this seems to be one of them, in which we meet with a variety and complexity of pathological conditions, all of importance, and all to be kept in view in their treatment. It is true that of these conditions some may arise from others according to known physiological laws, as dark-coloured blood from impeded respiration, and it is right thus to explain them when possible; but the uniform endeavour to trace all to one primary change, or rather, as is more frequently done, to assume one change to be primary, and all other morbid states to be but emanations from it, is not only unphilosophical, but is too apt to tinge our practice with undue partiality."

Now what is the fact? Do we not find one important, uniform, and visible change of the blood, in all cases of epidemic cholera, even before vomiting or purging takes place? Do we not know from direct analysis, which I published two months ago, and which has been amply corroborated by several most competent gentlemen, that this change is of vital importance in epidemic cholera; and are we not compelled to acknowledge that this epidemic, though an acute, is not an inflammatory disease, and that it generally runs its course long before any organic change in the solids can possibly take place. We are also forced to acknowledge, from anatomical, pathological, and chemical investigations, that this general and extensive change in the blood is the proximate cause of the disease, or, in other words, the disease itself, as I have proved in this treatise.

"What authors have styled the disease, or what the more correct pathologists of the present day call the proximate cause, viz. the morbid lesion alone merits the appellation of a cause. That only deserves the name of a physical cause, which so constitutes the disease that when present the disease exists; while it remains, the disease remains; when changed or removed, the disease is equally altered or destroyed.*

From what I have published, both in this volume and in the *Lancet*, I need only remark that the intelligent reader is put in possession of all the

phenomena of the disease, and it will now be understood whether I have or have not pointed out the proximate cause of pestilential cholera.

If we attempt to discover the origin of acute diseases in the nervous system, we shall thereby understand the meaning of the words "lost labour."

Again, in the same page, we read the following sentence:—"According to this view, which is suggested with diffidence, the imperfection of the respiratory process will arise from the same cause as in congenital malformation of the heart, such as the persistance after birth of the foramen ovale, or the aorta arising from both ventricles, in which a very small proportion of the whole mas of blood is oxydized."

When the author of this sentence shall demonstrate to us oxydized blood, we shall acknowledge the discovery, and proclaim it accordingly!

Let any person carefully read in the "*Journal de Physiologie*" the admirable experiments of M. M. Majendie, Nysten, and Gaspard, and compare the symptoms which the animals experimented on presented, after different substances were injected into their veins, with those which we find to obtain in typhus and epidemic cholera, and the striking similarity will readily be acknowledged by every unprejudiced and well-informed man. A volume might be written on this subject.

Again, at page 394, we read:—"That the whole series of phenomena results from the action of a morbid poison on the body there can be no doubt; but as yet, as in the case of other fevers, we are ignorant of the precise nature of the primary change effected by it in various organs or systems; and it is to be feared that till more accurate ideas are attained respecting the pathology of fever in general, this ignorance will remain. In the febrile stage, we would remark, there are indications by no means equivocal of inflammatory affection of the brain, and occasionally of other organs, the analogy to fevers in general being in this respect preserved. Were we to judge solely from what we have ourselves observed of the commencement of the disease, we should consider the alimentary canal to be the part of the frame which first felt the influence of the poison; but we should consider the condition of the nervous and vascular system much too much in degree to be merely sympathetic of the state of the stomach and bowels. Many cases, moreover, which have been reported from abroad, particularly from India, lead to the opinion that in various instances the nervous system is primarily affected."

Can any thing be more "unphilosophical" than such language? What is the nature of this poison? Is it animal, vegetable, or mineral? Can any man give the smallest evidence of any poisonous substance ever having been detected in the fluids or solids of cholera subjects? "*De non apparentibus et non existentibus eadem est ratio.*"

We all know that the febrile stage (being a sequela of the disease) is not to be classed with the disease itself; for in the sequela we find several organic lesions, similar to those which we so frequently observe in post mortem examinations of typhus cases. In a word, we are, in this, paragraph to take it for granted, that a "morbific poison," "no doubt," explains the series of phenomena of this disease. Then the alimentary canal is first poisoned; but we should consider the "condition" of the nervous and vascular systems, much too "intense" in degree to be merely sympathetic of the state of the stomach and bowels. Again, many cases reported from India, "lead to the opinion" that in various cases the nervous system is primarily affected!

From *this* we learn that we are just as wise, as to the proximate cause, as when this disease made its appearance in Sunderland; and if this method of philosophising obtain, we shall so continue ad infinitum. For my own part I would rather have one well-conducted pathological or chemical experiment, *instante morbo*, for my guide, than a volume of such conjectures.

In our day we expect experiments and facts in elucidation of acute diseases, and we are aware that all definitions, except they are founded on sound pathology, are worse than useless.

ERRATA

Page	Line	
8	26	for "19, 15," read "29, 15."
9	12	for "30, 75," read "30, 25."
17	20	after "presented" insert "to."
45	1	for "existing" read "exciting,"
48	10	for "there" read "their."
84	18	dele "consecutive."
87	4	for "tartris" read "tartras."
90	11	for "flames" read "flame."
106	21	for "is" read "was."
114	21	for "fearful" read "hurtful."
118		dele SUMMARY.
95.		Contagion ought to have come in at the Conclusion.

